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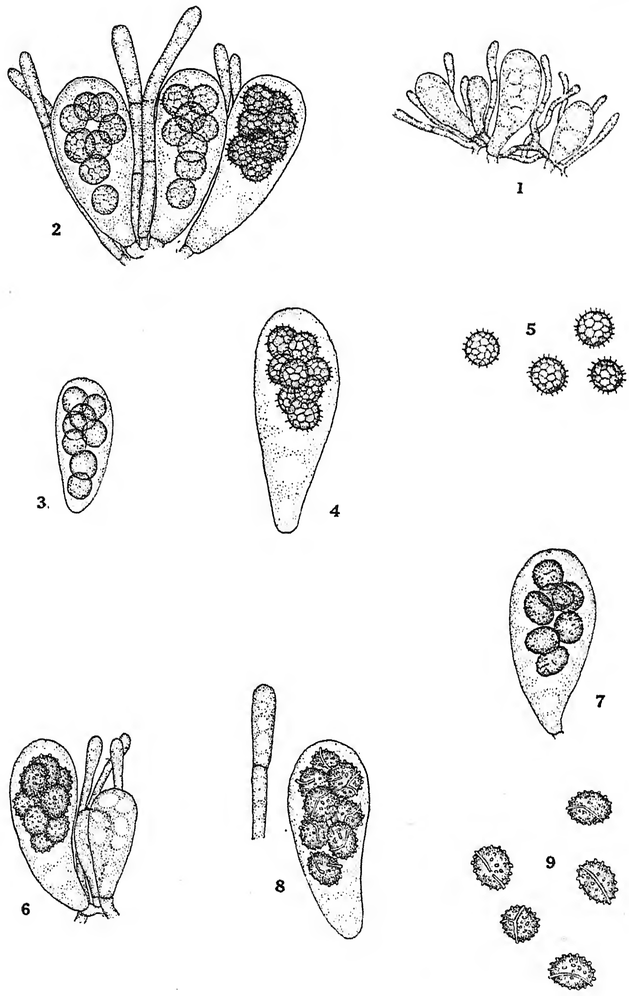

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MYCOLOGIA

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NORTH AMERICAN SPECIES OF ASCODESMIS

FRED J. SEAVER

(WITH PLATE 172, CONTAINING 9 FIGURES)

During the month of January, 1915, the writer secured an excellent growth of a species of *Ascodesmis* on the excrement of pigs sent from Porto Rico[1] by Mr. George L. Fawcett. The spores of this species were slightly ellipsoid and, when mature, were strongly roughened, although they were never found to be reticulate. At first it was thought that this species might be distinct from *Ascodesmis nigricans* in which species the spores are usually described as reticulate. Later, however, it was concluded that the apparent difference in spore characters was simply due to variation and the Porto Rican plants were finally referred to *Ascodesmis nigricans,* the only species known from North America.

In November, 1915, an abundant growth of *Ascodesmis nigricans* was obtained on the excrement of raccoon dog from the Bronx Zoological Garden. Careful study of this species from

[1] A collection of pig dung from New Jersey was placed in culture during the present season in order to determine whether the Porto Rican species was a geographical species or was governed by the substratum alone as is the case with so many of the coprophilous discomycetes. On December 11, 1915, since this paper was submitted, the species described here as new was found also on the New Jersey material. In all essential points the New Jersey specimens agree with the specimens grown on the same kind of material from Porto Rico and both differ from *Ascodesmis nigricans,* which we have still growing in the laboratory, as pointed out in the illustrations and descriptions accompanying this paper.

material derived from these cultures showed the spores to be globose and at maturity perfectly and distinctly reticulate, the ridges of the reticulations extending beyond the periphery of the spore as minute spines.

After a comparative study of the spores of the two specimens of *Ascodesmis,* the one grown on the excrement of pigs from Porto Rico and the other on the excrement of raccoon dog from the Zoological Garden, it was decided that they represented two distinct species.

So far as noted, the external characters of the two plants were identical. The apothecia appeared on a superficial mycelium and consisted of a tuft of asci without any well-developed excipulum. The form and size of the apothecia in the two species is almost identical. The spores of the Porto Rican species are slightly ellipsoid, although they would pass as subglobose. The chief difference is in the spore markings, those of the Porto Rican species consisting of tubercles or short interrupted ridges. In addition to this, these spores are often marked with an irregular ridge of meridial band which may be simple or occasionally branched. Since several hundred spores have been examined and these characters found to be constant and decidedly different from those of *Ascodesmis nigricans,* the Porto Rican specimens are regarded as new and described as *Ascodesmis porcina.* The differences in spore characters are shown in the accompanying plate. The following is a synopsis of the genus as at present known for North America.

ASCODESMIS Van Tiegh. Bull. Soc. Bot. Fr. **23**: 271. 1876

Apothecia minute, less than 1 mm. in diameter, very simple, consisting of a cluster of asci and paraphyses springing from a clump of basal mycelium; excipulum almost entirely undeveloped; asci comparatively few to each plant, very broad, 8-spored; spores globose or subglobose, hyaline, then pale-brown to blackish, becoming rough at maturity; paraphyses sparse.

Type species, *Ascodesmis nigricans* Van Tiegh.

Spores globose, reticulated. *A. microscopica.*
Spores subglobose, rough but not reticulated. *A. porcina.*

Ascodesmis microscopica (Crouan)

Ascobolus microscopicus Crouan, Ann. Sci. Nat. IV. **7**: 175. 1857.
? *Ascobolus caninus* Fuckel, Hedwigia **5**: 3. 1866.
Ascodesmis nigricans Van Tiegh. Bull. Soc. Bot. Fr. **23**: 275. 1876.
Boudiera microscopica Cooke, Grevillea **6**: 76. 1877.
? *Boudiera canina* Schröt. Krypt.-Fl. Schles. 3^2:55. 1893.
Boudiera Claussenii P. Henn. Hedwigia **42**: (182). 1903.
? *Ascodesmis reticulata* Bainier, Bull. Soc. Myc. Fr. **23**: 137. 1907.

Apothecia minute, less than 1 mm. in diameter, scattered or thickly gregarious, superficial, consisting of a tuft of asci and very stout paraphyses, at first entirely white, becoming dotted over with black specks, the ends of the asci filled with colored spores, finally becoming entirely black; excipulum almost wanting or consisting of loose mycelium similar to the paraphyses; asci broad-clavate to ovoid, reaching a length of 80 μ and a diameter of 30 μ, 8-spored; spores 2-seriate or irregularly crowded together, perfectly globose, becoming pale-brown and reticulated, reaching a diameter of 10–12 μ; reticulations net-like, the meshes reaching a diameter of 3 μ, the ridges of the reticulations thin and projecting about the periphery of the spore as minute spines; paraphyses hyaline, stout, scarcely enlarged above, reaching a diameter of 5–6 μ.

On excrement of dogs and tigers, less frequently on the excrement of other animals.

TYPE LOCALITY: Europe.

DISTRIBUTION: New York; also in Europe.

ILLUSTRATIONS: Ann. Sci. Nat. IV. **7**: *pl. 4, f. 20–23;* Zukal, Mycol. Unters. *pl. 2, f. 5–10;* Hedwigia **42**: (182), *f. 1–3.*

Ascodesmis porcina Seaver, sp. nov.

Apothecia very small, scarcely visible, scattered or thickly gregarious, at first subglobose, expanding and becoming subdiscoid, externally whitish or pallid, not exceeding 0.5 mm. in diameter; hymenium strongly convex, becoming dark, finally almost black by reason of the dark colored spores; excipulum almost wanting; asci broad clavate to ovoid, abruptly narrowed into a short stem-like base, reaching a length of 75–90 μ and a diameter of 25–35 μ; spores 2-seriate or very irregularly bunched near the end of the ascus, subglobose, at first hyaline and smooth, becoming pale-

brown and rough, reaching a diameter of 10–13 μ, or occasionally 10–11 $\times$ 12–13 μ; spore-roughenings very variable, consisting of minute rounded wart-like projections, short interrupted ridges, or often with one conspicuous simple or branched ridge extending across the visible surface of the spore; paraphyses stout, gradually enlarged at their apices, reaching a diameter of about 5 μ.

On excrement of pigs.

TYPE LOCALITY: Grown in the laboratories of the New York Botanical Garden on pig dung sent from Porto Rico.

DISTRIBUTION: Cultivated on pig dung from Porto Rico and New Jersey.

NEW YORK BOTANICAL GARDEN.

EXPLANATION OF PLATE CLXXII

Figs. 1–5. *Ascodesmis microscopica* (Crouan) Seaver.
Fig. 1. Young asci and paraphyses.
Fig. 2. Asci and paraphyses showing different stages in their development.
Fig. 3. Ascus with young spores.
Fig. 4. Ascus with mature spores.
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Fig. 6. Young and mature asci.
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Fig. 9. Mature spores isolated.

FUNGI PRODUCING HEART-ROT OF APPLE TREES

B. O. Dodge

(With Plates 173–176, Containing 10 Figures)

Any one familiar with the old apple orchards of the East is aware that there must be specific causes connected with the rotting of the trunks of the trees. When trees that ought to be in the prime of life are found with huge knot-holes leading into great hollows in the trunk, the pathologist feels perfectly certain that some fungus has gained entrance to the wound caused by the removal of a limb at this point.

At Camp Columbia, near Litchfield, Conn., and on the farms in the vicinity, there are many old orchards that are especially favorable for a study of diseases peculiar to the apple tree. Nature is left to take its course in the abandoned orchard, with the result that fungi directly or indirectly the cause of wood-rot are given an opportunity to develop their fruiting bodies, without which the identification of the disease is still more uncertain. Some of these trees seventy-five or one hundred years old are still bearing apples, although the trunk is a mere shell of sap-wood, frequently only a part of the shell remaining. A large percentage of the trees bear evidence of the presence of fungi commonly known as heart-rots.

I have made an effort to collect various types of fungi growing on living trees with the hope that something further might be contributed toward the discovery of the particular fungi causing these destructive heart-rots. I was greatly assisted in this work of collecting and photographing the specimens by Mr. Paddock, a student in botany at the camp.

The well-known rots of hickory, oak, maple, elm, etc., were fairly common there. A number of bracket and encrusting forms (*Polyporus versicolor, Schizophyllum commune, Irpex lacteus,* etc.) were found on dead limbs and trunks of the apple, but as

these grow everywhere on all sorts of timber their presence on apple is not particularly significant as causing the diseases of the living trees. A perennial form resembling the fire punk (*Fomes igniarius*) occurs on a few apple trees just below the camp. On one of the trees the fungus has developed the fruit bodies on the cut ends of stubs of limbs, showing probably where the fungus gained entrance in years past through faulty pruning.

But all these are doubtless comparatively secondary in causing the very destructive heart-rots found in these old orchards. A number of very conspicuous and striking forms which I have found are beyond doubt the main causes which limit the life of the orchard tree. This is not saying that these fungi are directly parasitic, but by eating out the heart-wood of the tree they lead to the breaking off of the larger branches and finally to the destruction of the trunk.

During the early part of August, Mr. Moldenke first called my attention to a cluster of "mushrooms" growing on the side of a living apple tree in an orchard through which the Columbia student surveyors were "running a railroad." The fungus had grown out from a small spot in the sap-wood and the line of decay was found to lead into the heart-wood, which was very badly rotted. Figure 2 on plate 173 shows such a punk as it grows on the living tree. Professor Finch a few days later located a similar fungus on a comparatively young apple tree near the cottage at South View Inn. This one grew out from a crack caused by the splitting of the trunk where a limb had been torn out (*Pl. 173, f. 3*). It was a beautiful milk-white cluster, so fragile that the slightest pull was sufficient to break off a piece. An old punk just below this cluster, evidently a growth of the preceding year, showed how discolored, hard, and leathery the fungus may become as it dries out. Two very beautiful specimens (*Pl. 173, f. 2*, and *Pl. 174, f. 2*) were found on a tree in Mr. Weik's orchard. Several others were brought in during the middle of August from orchards in the vicinity. The specimens, while varying greatly in form and size, appear to belong to the same species. It is a form that first attracted the attention of Dr. Burt at Riverside, Maine, in 1898. He sent it to Professor Peck, New York State

botanist, who recognized that it was a new species and described it in the *Bulletin of the Torrey Botanical Club,* Vol. 26, 1899, under the very appropriate name, *Polyporus admirabilis,* "the wonderful polypore." He added Dr. Burt's remarks: "The fresh tufts of clear white trumpet-shaped pilei are suggestive of clusters of giant calla lillies." Peck originally described the fungus rather inadequately because of the lack of a large number of specimens at the time. He says: "Pilei tufted, large, more or less imbricated, nearly entire, centrally depressed or subinfundibuliform." This would not cover the solitary, flattish, nearly lateral forms. Such forms are shown in *Pl. 173, f. 1.* Professor Underwood also found one of these flat forms on an apple tree at Redding, Conn., in August, 1906, and another less distinctive with much thicker flesh in 1907. These two specimens are in the herbarium of the New York Botanical Garden.

Forms frequently occur that appear from a distance to be made up of several individuals crowded together forming a "cluster." Such specimens are shown in *Pl. 173, f. 1,* on the trunk, and *Pl. 174, f. 2.* These are simply one fungus body so lobed and folded as to resemble a tuft or cluster composed of several individuals growing close together. Figure 2, on plate 174, looks like three punks (pilei), although it is only a peculiarly folded single specimen. There are, however, such clusters as Peck described made up of individuals somewhat imbricated or fused together.

Another specimen of this species mentioned by Peck (Annual Report 54, p. 154, 1901) came from Lake George. Of this one he says: "The specimen here recorded is less regular and deeply depressed in the center than a typical form which was found growing at the base of an apple tree in Maine." In the original description the surface is described as "glabrous, white or slightly tinted with pale yellow or cream color; pores minute, rotund, whitish; pilei 10–15 cm. broad, united at the base, forming tufts 30 cm. or more in diameter."

The forms that I have found at Camp Columbia are beautiful, large, vigorously growing punks, easily recognizable and conspicuous objects. One of their most characteristic features as compared with the forms of another type to be mentioned later,

is the peculiar, smooth, "glacé kid glove" feeling of the surface. They justify Professor Peck's characterization "*admirabilis*" in every respect.

With the aid of Dr. House, the state botanist, I was enabled to examine all of Peck's specimens of this fungus in the herbarium at Albany. One specimen collected by S. H. Burnham on an apple tree trunk at Pike Pond, New York, July, 1910, has a margin that is beautifully and evenly scalloped. The surface is even, light-straw-colored, and has characteristically a "kid glove feeling." There are one or two faint zones near the margin formed by depression but there are no color differences. There is a slight tendency to splitting up or pileolation, there being one accessory pileus. The stem is much reduced or even lacking. There is another specimen from Crown Point, N. Y., collected by Dr. Peck, which is a cluster of three plants now in very poor condition. No host is given but it is evidently the same species.

I have found *Polyporus admirabilis* only on apple trees, but it is to be noted that there are two specimens in the State Herbarium under this name that are of special interest, since they were collected on other hosts than the apple tree. The one on ash found by S. H. Burnham at Vaughans, N. Y., July 6, 1907, and mentioned in the report for 1907, p. 12, is a dead-white form with minute pores. Two plants are joined together at their margins. The stems are quite distinct and prominent. The other specimen was collected by Mr. Burnham at the same place August 25, 1911, on a "living fallen butternut." The stem is central or slightly eccentric and more pronounced. All of these specimens are pure-white with no trace of straw-color, otherwise they resemble those growing on ash. These forms on the ash and butternut appear to be somewhat different from those on the apple tree and are certainly more like specimens of *P. Underwoodii* in Murrill's collections at the New York Botanical Garden, but whether these differences would hold in a larger range of specimens and whether the spores of these forms would grow on the apple tree, are questions of considerable interest and must be further studied. Another specimen in the Albany Herbarium, which plainly should be called *P. admirabilis*, bears the name *Polyporus Underwoodii*.

This was collected by Mr. Burnham at Pike Pond, July 23, 1910, on a fallen apple tree trunk. Just why this was called *Polyporus Underwoodii* and the one on the ash collected by the same person at the same place should be called *Polyporus admirabilis* is not clear. This specimen corresponds very well with the text description of *P. admirabilis* and to many of the forms collected at Camp Columbia. It shows distinctly the tendency both to bracketing and clustering. The margin is finely and irregularly scalloped. It has the "glacé kid finish" but is further markedly ribbed and streaked with faint zonations in form and color. The depressed, funnel-shaped disk is somewhat flesh-colored. The stems are quite conspicuous, though short, but the pores extend down to the base on the under surface.

In connection with the question as to the group relationship of these forms, a specimen of "*Polyporus Underwoodii*" from the Albany collection is of considerable interest. Lloyd has evidently noted the obvious resemblance of these apple tree forms to the *Melanopus,* black stemmed, group of polypores in stating that Peck's *P. admirabilis* is a variety of *P. varius,* or belongs to that group, though he does not state that any of his specimens of the apple tree fungus show a blackening of the stem. This specimen of *P. Underwoodii* found on a willow stump to which I refer was collected by H. J. Banker at Schagticoke, N. Y., August 27, 1908. It has the general form and size of *P. admirabilis* with the irregularly scalloped margin and depressed center. The specimen is somewhat weathered and the surface is roughened and blackish-spotted. The pore characters are not different. It has a conspicuous, sterile, blackened, eccentric stem and, like a smaller specimen of the same collection, bears some resemblance to a much exaggerated and unusually thin form (for its size) of *P. varius.*

Another specimen collected by Dr. Banker August 2, 1904, and referred to by Peck in describing *P. Underwoodii* is still closer to *P. admirabilis* in appearance, but it has the black, though very short stipe. One specimen from this collection given to the New York Botanical Garden has a central stipe but otherwise resembles the 1908 specimen from the same regions. Further collections of

this type of fungus with the black stem but otherwise resembling *P. admirabilis* may clear up the relation between the apple tree form and those of the *Melanopus* group, and all these relationships must be cleared up if the question of protecting the apple tree against heart-rot is to be attacked with any degree of success.

In every case where such a punk was discovered on the apple, it was found that the heart-wood was in a bad state of decay, although in some cases one would say, judging from external appearances, that the tree was perfectly sound. The pores in all of these species are very small and those of *P. admirabilis* are extremely minute. The tubes are 1–2 mm. long and the flesh varies in thickness 1–2 cm. at most toward the point of attachment. As I have noted, some of the specimens show lines or streaks extending from the margin to the central depressed region (*Pl. 174, f. 2*). The single fruit-body shown at the base of the tree in *Pl. 173, f. 1*, measured eighteen inches along its greatest diameter and weighed four and one half pounds. This is probably the largest specimen of the species yet recorded and it has been placed in the Herbarium of the New York Botanical Garden. Dr. Murrill has confirmed the identification of the species.

So far as I find, there is little in the literature relating to fungi that cause heart-rots of apple tree. Morse and Lewis of the Maine Agricultural Station describe several diseases affecting the leaves and fruit of apples and discuss briefly the wood-rots of the apple tree, but they do not ascribe the rots to any particular fungi. Craig has made extensive surveys of the apple orchards of New York and has discussed the subject of pruning as connected with the decay of trees. He does not mention having seen this fungus or any other of its kind on the living trees. The punks of this polypore are evidently either rare or have been overlooked, since there are only the half dozen specimens described above in the herbarium at Albany and two at the New York Botanical Garden. It will be interesting to learn whether a long rainy season, such as we had in July and August, 1915, is one of the conditions necessary for the production of the punks.

We found another type of fungus growing from a decayed root stub in Mr. Bennett's grove near Camp Columbia. It is a white

polypore (*Pl. 174, f. 1*) three or four inches in diameter, depressed or funnel-shaped and somewhat inequilateral. The surface is radially split or cracked and somewhat lobed, and is also broken up into concentrically arranged scale-like tufts. The tubes are large and angular, running down on the stem, which is very well marked. This plant is tough from the first, about the consistency of the railroad tie fungus (*Lentinus lepideus*). It was kept under observation for about three weeks. At the time the photograph shown in *Pl. 174, f. 1,* was taken, Mr. Paddock called my attention to the spores that were being shed in little white clouds. It is possible that this is a form of *Polyporus admirabilis* that grows saprophytically on wood other than that of the apple tree. The character of the surface, the large size of the angular pores, and its place of growth, suggest more strongly, however, that it is quite another species. Dr. Murrill, who has examined this specimen, informs me that it is near *P. Underwoodii,* although it does not have a black stem as do both the specimens at Albany and as required by the description.

The apple grower is much more interested in the extent of damage that is being wrought than in controversies over the identity of the fungus causing the disease. He wants to know how to recognize the fungus, how to cure the diseased tree, and how to prevent further infection. While it is the part of wisdom to follow the most approved methods of pruning, it may be well to consider whether the ordinary precautions that are taken to coat the cut surface with paint is really of much avail in keeping out the spores of these fungi. Freezing and thawing, wetting and drying certainly will cause cracks to open up and, unless the surface is kept well painted until a callus completely covers the wound, there can be no certainty that some fungus will not gain entrance. The fungus here under consideration causing the heart-rot of apple trees could, perhaps, be more easily controlled by the destruction of the spore-producing bodies themselves, since they are large and conspicuous and easily removable.

OTHER TYPES OF PUNKS CAUSING HEART-ROT OF APPLE TREES

As I have noted previously, *P. admirabilis* belongs to the group in which the fruit-body has a stem, although it may be very much

reduced. There is a series of other forms that were even more common on apple trees during the past season, which are brackets in form and are often placed one above the other and closely connected. A beautiful example of this type (*Pl. 175, f. 2*) was found August 10 on a tree in the orchard near Robert Hill's residence, a few miles from Camp Columbia. In color, size of pores, zonation and consistency of flesh, I was unable to distinguish between it and such a form of *P. admirabilis* as is shown in *pl. 173, f. 3*. The fact that the former is a shelving or bracketed punk, however, suggests that it must be an entirely different species. Further search has shown that many apple trees were infected this year with a form resembling this one. It is impossible to say what conclusion will be reached as to the number of species involved until a more extensive study of these apple tree fungi has been made. I have found similar punks in many old orchards in New York, New Jersey, and in several localities in Connecticut, and have a form collected by Professor Harper on a living apple tree at Bedford City, Va., September 16. These forms are much more abundant at Camp Columbia than *P. admirabilis*. Most commonly the base of the tree would be quite covered on one side with such punks as are shown in *Pl. 175, f. 1*. The heartwood as the result of the attack is usually very spongy or entirely decayed. The fungi are so fragile that it is difficult to cut out the bark and sap-wood bearing them without shattering the punks. The upper surface in this particular type is soft and spongy, at first somewhat "foamy" in appearance. They are sometimes quite thin at the edge, thickening further back or even becoming hoof-shaped (*Pl. 175, f. 1*). The only difference between this form and the one found at Robert Hill's appears to be the character of the upper surface and the texture of the flesh. The pores are somewhat larger and the flesh thicker in the former. Both forms were observed for several days as they were growing and these differences were quite noticeable from the first.

A somewhat different type was found by Mr. R. R. Stewart at New Rochelle, N. Y., September 21, and its pore surface is shown in *Pl. 175, f. 3*. This single specimen was growing on a living apple tree about five or six feet from the ground. It is a thin,

flat form about four inches wide by six inches long, and not over half an inch thick. The tubes are about one fourth of an inch long, the flesh is zonate and about as thick as the tubes are long. The fungus was white when fresh but it turned yellowish or straw-colored on drying. We have further specimens of this type of fungus, many of them growing on the inside of the hollow trunks of the apple tree. Mr. Burgdorff called my attention to one of this kind at Scarsdale, November 17. About five feet above the ground there was a large knot-hole leading into the hollow trunk of an apple tree about seventy-five years old. Several overlapping, much divided brackets had developed inside the trunk on the decayed heartwood about a foot above the opening formed by the knot-hole. This led me to examine more closely hollow trees in different localities and, in one orchard at Spring Valley, N. Y., on November 26, we found six different trees that had the same type of fungus entirely concealed within. In all cases the color was masked by the pulverized wood, the tubes and flesh were dingy or brownish. The upper surface especially was a reddish-brown. The ones found at Spring Valley were hard and dry and had evidently reached maturity several weeks previously. On December 7, Mr. Burgdorff brought in another specimen of this same general type, although there are in this one certain peculiarities that may serve to connect up many of the forms that are found on the apple tree. It was late in the season, the fungus was in fairly good condition, and spores could be found in abundance. It was about five inches long and six inches wide, consisting of several shelving brackets grown together behind, and the flesh was beautifully zonate and at least an inch thick, thinning out toward the margin. The tubes were about one fourth of an inch in length.

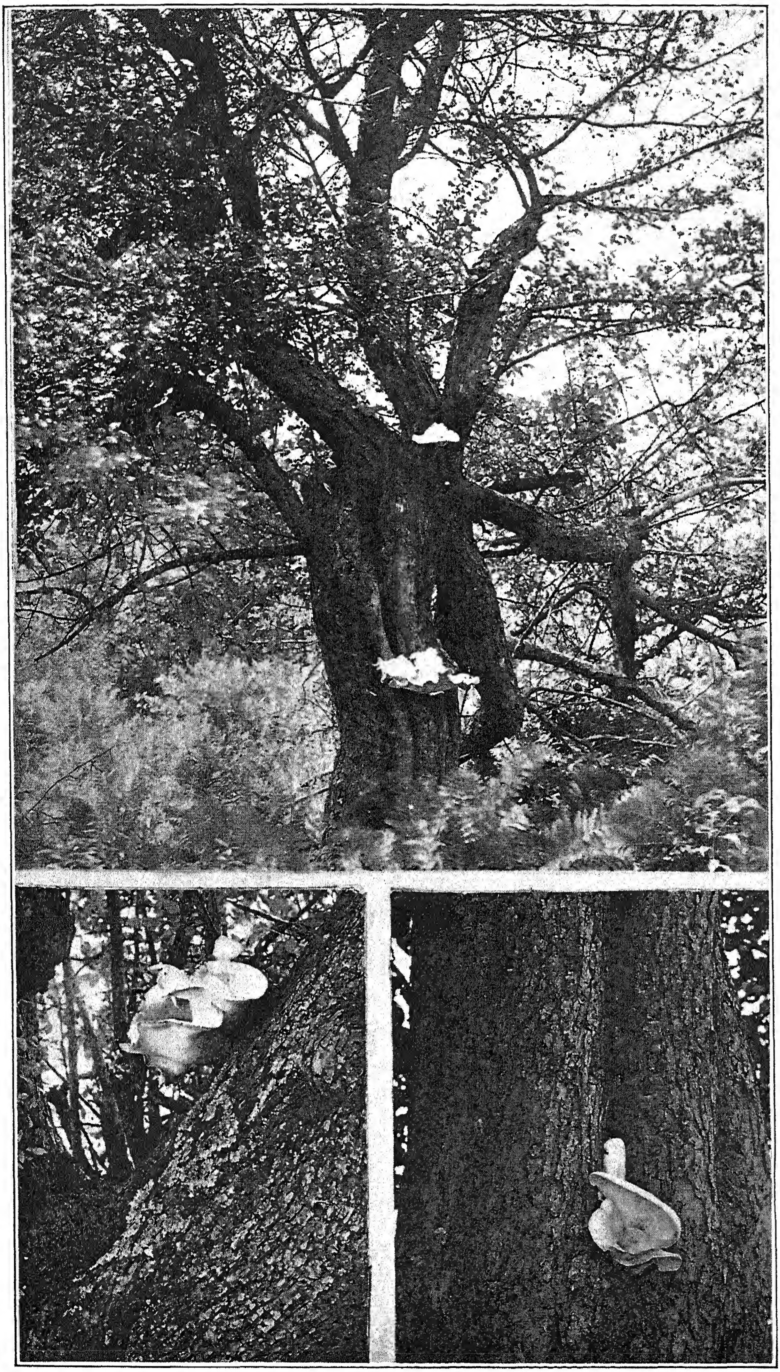
Professor Harper, as noted above, found quite another type growing on an apple tree at Bedford City, Va., September 16. This form, shown on *Pl. 176,* resembles the one shown on *Pl. 175* with respect to surface markings, etc., but it is a solitary form, more hoof-shaped, and has flesh that is several inches thick and strikingly zonate. The tubes are half an inch long and very much larger than those of any other specimens previously men-

tioned. It is a heavy, soggy fungus, drying hard and horny. Dr. Murrill identifies this form as *Spongipellis fissilis.*

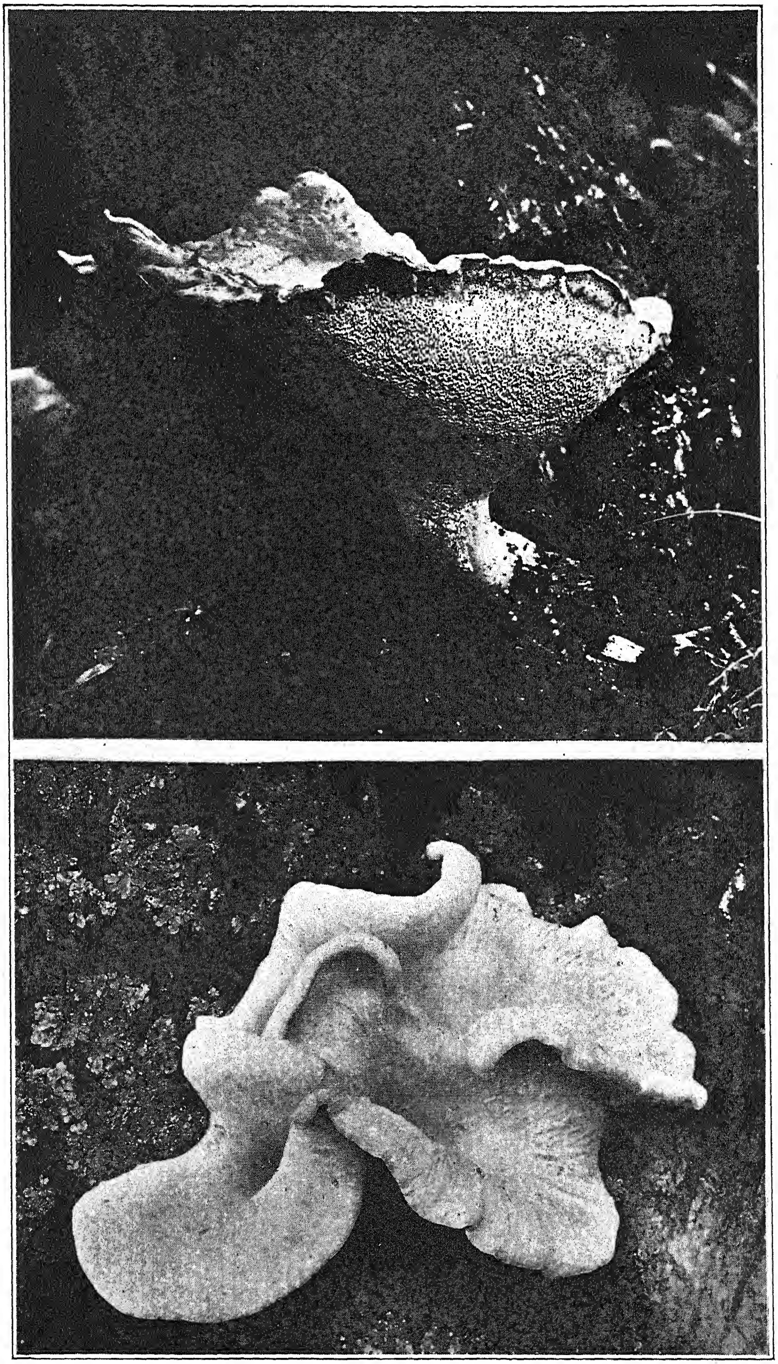
We have thus several types of the second form of fungus causing a heart-rot of the apple trees. Just what is their identity cannot be determined with certainty at present. Dr. Murrill, who has seen some of our specimens from the vicinity of New York City, identifies them as *Spongipellis galactinus.* There is a specimen at the New York Botanical Garden bearing this name collected by F. C. Stewart from a living apple tree. His field notes state: "Pure white, inside a hollow apple tree, Redding, Conn., 1907." Murrill mentions this peculiarity in a note (Bull. Torrey Club **32**: 476, 1905). He says: "One of its favorite hosts is the apple tree, on which it has several times been found in New York and Connecticut, growing inside partially decayed trunks or emerging from knot-holes in living trees. When fresh, it is pure-white or watery-white and so full of water that this may be squeezed out as from a sponge."

This is a very interesting series of forms connected with the destruction of orchards of the region. None of them has been hitherto regarded as particularly damaging to the apple tree, but there can be no question, in my opinion, that they are quite limited to the apple tree. Mr. Lloyd reports twenty collections of this second series of types, most of them from apple trees of the New England States. A few are from chestnut. He calls them *Polyporus spumeus* var. *malicolus.* Lloyd evidently recognized this form as particularly limited to the apple and mentions that they are the cause of heart-rot of apple trees of New England. Whether his identification of these forms is correct, is a question that can be determined only by further study of the group, which should, of course, include inoculation experiments.

COLUMBIA UNIVERSITY,
NEW YORK CITY.



POLYPORUS ADMIRABILIS PECK



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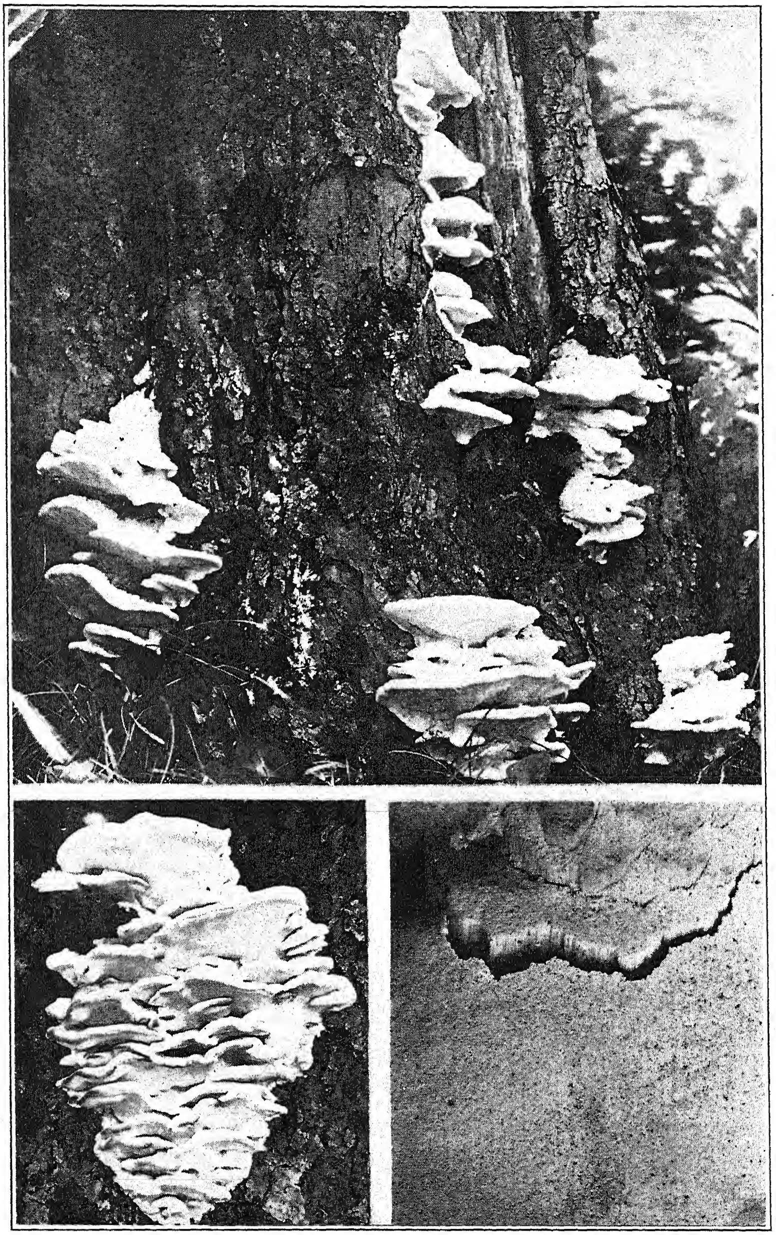
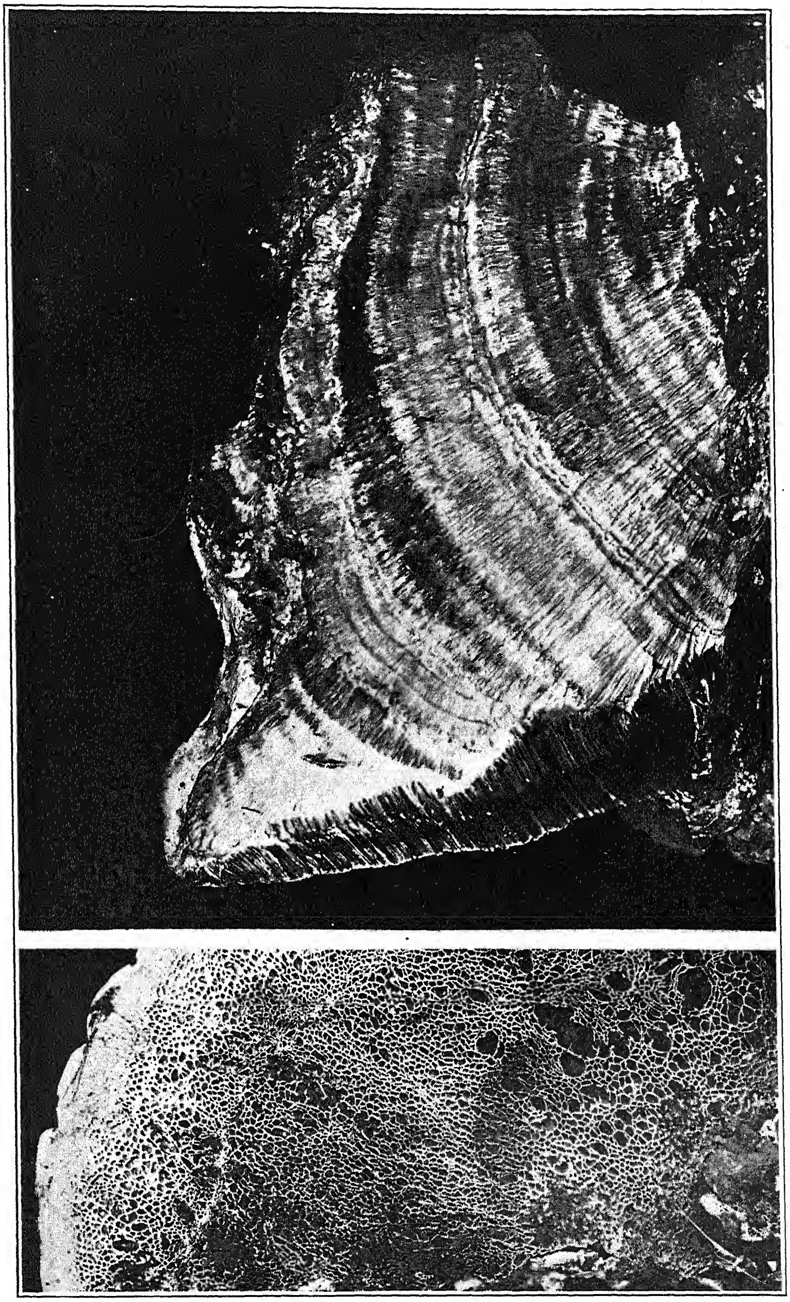
2. POLYPORUS ADMIRABILIS PECK



SPONGIPELLIS GALACTINUS (BERK.) PAT.



SPONGIPELLIS FISSILIS (BERK & CURT.) MURRILL

EXPLANATION OF PLATES CLXXIII–CLXXVI

All the specimens mentioned here were collected on living apple trees, with the exception of that shown on *Pl. 174, f. 1.*

PLATE CLXXIII

Fig. 1. An old apple tree that had been struck by lightning some time in the past. Three punks matured August 15, 1915. The one below on the trunk was eighteen inches across. These are good specimens of *Polyporus admirabilis.*

Fig. 2. Shows a cluster of the punks apparently growing from a healthy limb. In reality the heart-wood was decayed. Specimens now in the herbarium of the New York Botanical Garden.

Fig. 3. *Polyporus admirabilis* on a young apple tree at South View Inn.

PLATE CLXXIV

Fig. 1. A specimen of *Polyporus* near *P. Underwoodii* found on a decayed root stub in Bennett's grove.

Fig. 2. *Polyporus admirabilis* from Mr. Weik's orchard. A much folded specimen resembling a cluster of three individuals.

PLATE CLXXV

Fig. 1. These specimens have been identified by Dr. Murrill as *Spongipellis galactinus.* Would be called *Polyporus spumeus* var. *malicolus* by Mr. Lloyd.

Fig. 2. The specimen from Robert Hill's orchard near Camp Columbia has many of the characters of *P. admirabilis,* yet is plainly one of the bracket forms like those shown in Fig. 1.

Fig. 3. Pore surface from a specimen found by Mr. Stewart at New Rochelle, September 21, 1915.

PLATE CLXXVI

A form found by Professor Harper on living apple tree at Bedford City, Virginia, September 16, 1915, identified by Dr. Murrill as *Spongipellis fissilis.*

Fig. 1. Shows the thick flesh, which is beautifully zonate, the long tubes, and rough surface.

Fig. 2. View of the pore surface.

UREDINALES OF PORTO RICO BASED ON COLLECTIONS BY F. L. STEVENS[1]

J. C. Arthur

Species Reported from Porto Rico Not Represented Above

110. Ravenelia portoricensis Arth., on *Cassia emarginata* L. (*Caesalpiniaceae*), Ponce, Dec. 3, 1902, A. A. Heller *6193*. Also in Jamaica on *Cassia* sp.

111. Hemileia vastatrix B. & Br. on *Coffea arabica* L. (*Rubiaceae*), said to have once been found, and subsequently exterminated.

112. Tranzschelia punctata (Pers.) Arth. (*Puccinia Pruni-spinosae* Pers.), on *Amygdalus persica* L. (*Amygdalaceae*), Mayagüez, May, 1903, F. S. Earle *83*. Also in Bermuda on same host.

113. Uromyces Cologaniae Arth., II, on *Teramnus uncinatus* Sw. (*Fabaceae*), Cayey, mountai nside north of city, January, 1911, E. W. D. Holway.

114. Uromyces Howei Peck, on *Asclepias curassavica* L. (*Asclepiadaceae*), Comercio, February, 1911, E. W. D. Holway.

115. Uromyces Pavoniae Arth., on *Pavonia racemosa* L. (*Malvaceae*), Mayagüez and Joyua, June–July, 1901, L. M. Underwood *193*.

116. Puccinia purpurea Cooke, on *Holcus Sorghum* L. (*Sorghum vulgare* Pers.) (*Poaceae*), La Carmelita, April, 1904, G. P. Clinton; Rio Piedras, May, 1912, Cowgill & Johnston *505*. Also on same host in Cuba; on *Holcus halepensis* L. (*Sorghum halepense* L.) in Cuba and Jamaica; and on *Sorghum officinarum* L. in Bermuda.

117. Puccinia Scirpi DC. (*Aecidium Nymphoidis* DC.), on *Scirpus lacustris* L. (*Cyperaceae*), in a meadow near Guanica, Dec. 15, 1902, A. A. Heller *6291*. The aecia

[1] Continued from Mycologia 7: 332. 1915.

were collected by Charles Wright on *Limnanthemum Grayanum* Griseb. (*Menyanthaceae*), in Pinar del Rio, Cuba, December, 1857 or 1858. No other West Indian stations are known.

118. **Puccinia Cordiae** sp. nov.

Uredinia hypophyllous, scattered, sometimes in coalescent groups of a few sori each, round, 0.2–0.4 mm. across, dark cinnamon-brown; paraphyses peripheral, hyphoid, 10–18 by 45–75 μ, the wall thin, 1 μ, colorless; urediniospores broadly ellipsoid or globoid, 21–25 by 28–35 μ; wall golden-brown, 1.5–2 μ thick, usually thicker above, 5–12 μ, often somewhat thickened at hilum, closely verrucose, the pores indistinct, probably 3 or 4, equatorial.

Telia resembling uredinia but darker color, chestnut-brown; teliospores ellipsoid, 19–26 by 37–55 μ, rounded at both ends, not constricted at septum; wall dark chestnut-brown, uniformly thick, 2.5–3 μ, or slightly thicker above, very coarsely and sparsely verrucose, especially above; pedicel colorless, 6–9 by 30–40 μ, hygroscopic near base, swelling in water to 20 μ in diameter.

ON EHRETIACEAE:

Cordia alliodora (R. & Pav.) Cham., Ponce, January, 1911, E. W. D. Holway.

A rust on *Cordia* sp. from Peru has been described by Hennings under the name *Uredo Cordiae* (Hedwigia 43: 163. 1904). The morphological characters are similar, but in habit it is said to produce gall-like swellings in the leaves and shoots resulting in witches-brooms, while the material from Porto Rico shows nothing of this sort.

119. PUCCINIA XANTHII Schw. on XANTHIUM LONGIROSTRE Wallr. (*Ambrosiaceae*), San Juan, February, 1914, Britton and Cowell *1485;* Santurce, February, 1914, J. R. Johnston *1338*. Also in Cuba and St. Domingo on same host.

120. UREDO SUPERIOR Arth. on *Fimbristylis spadicea* (L.) Vahl (*Cyperaceae*), low ground along the coast, eight miles west of Ponce, Dec. 12, 1902, A. A. Heller *6279*. Also reported by Mayor (l. c., p. 581) from Haiti on same host.

121. UREDO ARTOCARPI B. & Br. (*Physopella* (?) *Artocarpi* Arth.) on *Artocarpus communis* Forst. (*Artocarpaceae*), Mayagüez, April, 1904, G. P. Clinton *162*. Only American station known.

122. UREDO GYNANDREARUM Corda, on *Habenaria maculosa* L. (*Orchidaceae*), Cataño, January, 1911, C. F. Millspaugh *257*. Also on same host, El Yunque, Cuba, December, 1910, J. A. Shafer *7992*. Both specimens were found in the phanerogamic collection at the New York Botanical Garden.

SPECIES REPORTED FROM THE WEST INDIES BUT NOT KNOWN FROM PORTO RICO

123. COLEOSPORIUM EUPATORII Arth., on *Eupatorium macrophyllum* L. (*Carduaceae*), Cuba.
124. ALVEOLARIA CORDIAE Lagerh., on *Cordia cylindrostachya* R. & S. (*Ehretiaceae*), Jamaica.
125. RAVENELIA HUMPHREYANA P. Henn., on *Poinciana pulcherrima* L. (*Caesalpiniaceae*), Cuba, Jamaica.
126. RAVENELIA PAPILLIFERA Sydow, on *Cassia angustisiliqua* Lam. (*Caesalpiniaceae*), Bahamas.
127. CALLIOSPORA FARLOWII Arth., on *Parosela domingensis* (DC.) Heller (*Fabaceae*), Cuba.
128. PROSPODIUM BAHAMENSE Arth., on *Tecoma Leucoxylon* (L.) Mart. (*Bignoniaceae*), Bahamas.
129. PROSPODIUM PLAGIOPUS (Mont.) Arth. (*Puccinia plagiopus* Mont.) on *Tecoma lepidota* (H. B. K.) DC. (*Bignoniaceae*), Cuba.
130. NEPHLYCTIS TRANSFORMANS (Ellis & Ev.) Arth. (*Puccinia transformans* Ellis & Ev., *P. exitiosa* Syd. & Holw.), on *Stenolobium Stans* (L.) D. Don (*Tecoma Stans* Juss.) (*Bignoniaceae*), Bahamas, Cuba.
131. GYMNOSPORANGIUM BERMUDIANUM (Farl.) Earle, on *Juniperus bermudiana* L. (*Juniperaceae*), Bermuda, on *J. lucayana* Britt., Bahamas.
132. ERIOSPORANGIUM EVADENS (Harkn.) Arth., on *Baccharis* sp. (*Carduaceae*), Cuba.
133. UROMYCES MEDICAGINIS Pass. (*Nigredo Medicaginis* Arth.) on *Medicago denticulata* Willd. (*Fabaceae*), Bermuda.
134. UROMYCES TRIFOLII (Hedw. f.) Lév. (*Nigredo Trifolii* Arth.) on *Trifolium repens* L. (*Fabaceae*), Jamaica.

135. PUCCINIA CLADII Ellis & Tracy, on *Mariscus jamaicense* (Crantz) Britt. (*Cladium effusum* Torr.) (*Cyperaceae*), Bermuda.

136. PUCCINIA OXALIDIS (Lév.) Diet. & Ellis (*Argomyces* (?) *Oxalidis* Arth.), on *Ionoxalis Martiana* (Zucc.) Small (*Oxalidaceae*), Jamaica.

137. PUCCINIA OPULENTA Speg., on *Exogonium arenarium* (Steud.) Choisy (*Ipomoea arenaria* Steud., *I. Steudeli* Millsp.) (*Convolvulcaeae*), St. Thomas, March, 1913, J. N. Rose.

138. PUCCINIA SPILANTHIS P. Henn., on *Spilanthes oleracea* Jacq. (*Carduaceae*), Martinique.

139. PUCCINIA SPEGAZZINII DeT., on *Mikania scandens* (L.) Willd. (*Carduaceae*), Martinique, Aug. 4, 1913, F. L. Stevens *2971*.

140. UREDO ANTHEPHORAE Sydow, on *Anthephora hermaphrodita* (L.) Kuntze (*A. elegans* R. & S.) (*Poaceae*), Cuba.

141. UREDO HELICONIAE Diet., on *Bihai psittacorum* (L. f.) Kuntze (*Heliconia psittacorum* L. f.) (*Scitamineae*), Martinique, Aug. 4, 1913, F. L. Stevens *2967*.

142. UREDO WILSONI Arth., on *Anastrophia bahamensis* Urban (*Podostemaceae*), Bahamas.

APPENDIX

Since the study was completed of Professor Stevens' Porto Rican collections of 1912–14, and a large part of the article in type, additional collections made by Professor Stevens during June, July and August, 1915, have come to hand. In this supplementary lot of Porto Rican material there are some 254 numbers, representing about 78 species. A part of the new material, as would be expected, duplicates that previously secured, but in many instances it was obtained in new localities. In some cases a species was found not previously known from Porto Rico, or on an unrecorded Porto Rican host. The new material has, furthermore, proved surprisingly rich in species heretofore quite unknown to science.

In order to make the account of the Porto Rican rusts as com-

plete as possible, the species and hosts from the new material, not mentioned in the preceding part as occurring in Porto Rico, are here appended. In order to conserve space the remainder of the 1915 material is not cited, although many additional localities are represented.

Two species were added to the previous supplementary lists, after the statistics on pages 170 and 171 were in type. One was a Porto Rican species and the other from another West Indian island. The collections of 1915 here recorded add 12 species to the foregoing record of Porto Rican rusts. The total number of species of rusts now known from Porto Rico is brought up to 135, and from all the West Indian islands to 155. Of this large rust flora Professor Stevens secured during his twenty-four months' sojourn in the West Indies all but eleven of the known species from Porto Rico, and all but thirty from the whole West Indian flora. Truly a remarkable record. His collections supplied twenty species new to science and an equal number of additional species not previously recorded for North America, beside many new hosts.

ADDITIONAL SPECIES FROM PORTO RICO

143. RAVENELIA CEBIL Speg., on *Piptadenia peregrina* (L.) Benth. (*Caesalpiniaceae*) Peñuelas, July, 1915, II, *9139*. No authentic material of this South American species has been seen, but the ample Porto Rican material, so far as uredinia are concerned, agrees closely with Spegazzini's excellent description (An. Mus. Nac. B. Aires **19**: 295. 1909). The Porto Rican host, *P. peregrina,* is placed by Engler & Prantl in the same third section of the genus *Piptadenia* as the Argentine type host, *P. macrocarpa,* evidencing near relationship. The assignment of the collection is, therefore, made with considerable confidence, although the telia are absent.

144. RAVENELIA CASSIAECOLA Atks., on *Chamaecrista Aeschynomene* (DC.) Greene (*Caesalpiniaceae*), El Gigante, July 16, 1915, II, *8505*. Heretofore this rust has been known only from the southeastern United States.

145. PUCÇINIA CYNODONTIS DeLac., on *Capriola Dactylon* (L.)

Kuntze (*Cynodon Dactylon* Pers.), (*Poaceae*), Rio Piedras, June 11, 1915, II, *7009*, Mayagüez, June 16, 1915, II, *7114*.

146. UREDO PUSTULATA P. Henn., on *Stenorrhynchus lanceolatus* (Aubl.) Griseb. (*Orchidaceae*), Las Marias, July 10, 1915, *8185*. The first record of this species for North America, hitherto known only in Brazil.

147. UREDO GUACAE Mayor, on *Epidendrum difforme* Jacq. (*Orchidaceae*), Jejome Alto, July 17, 1915, *8434*, Bandera, July 15, 1915, *8669*. The same rust was collected on *Epidendrum rigidum* Jacq. at Summit Pass, south of Cayey, P. R., January, 1911, by E. W. D. Holway. It has not before been recognized as a part of the North American flora.

148. **Uredo venustula** sp. nov.

Uredinia hypophyllous, scattered, oblong or linear, 0.1–0.2 mm. broad by 0.3–0.8 mm. long, early naked, chestnut-brown, ruptured epidermis evident; paraphyses numerous, prominent upright, clavate-capitate, 16–20 by 40–55 μ, the wall chestnut-brown above, paler below, 1.5–3 μ along the stalk, 6–10 μ above; urediniospores broadly ellipsoid or globoid, 18–23 by 22–27 μ; wall light chestnut-brown, 1–1.5 μ thick, closely and finely echinulate, the pores quite distinct, 4, equatorial.

ON POACEAE:

Andropogon brevifolius Sw., Las Marias, July 10, 1915, *8147*.

A distinctive rust, with prominent sori, due to the great abundance of very dark paraphyses. The species is similar to *Uredo Kaernbachii* P. Henn., on *Andropogon Schoenanthus*, known only from the Bismark archipelago in the south seas. The color and size of both urediniospores and paraphyses are not materially different in the two forms, but the West Indian species has much thinner walls to the spores, and the sori are more prominent. Although both are on tropical grasses of wide distribution, yet they belong to different sections of the host genus, or to different genera according to some authors.

149. UREDO OLYRAE P. Henn., on *Oplismenus hirtellus* (L.) R. & S. (*Poaceae*), Las Marias, July 10, 1915, *8118*. The

thick-walled and coarsely echinulate spores without paraphyses readily distinguish this species from related forms. The type collection, with which the Porto Rican material has been compared, is from Peru, and on an undetermined species of *Olyra*. This is the second record for the species.

150. UREDO ANTHURII Hariot, on *Anthurium scandens* (Aubl.) Engler (*Araceae*), El Alto, July 16, 1915, *8716*. The host ranges from Mexico to Brazil. The fungus was described (Jour. de Bot. 1892, p. 458) from material collected on an undetermined species of *Anthurium* in the greenhouses of the Jardin des Plantes in Paris. The present record is probably the first of a collection from the field. The fungus on the Porto Rican material may be described as follows: Uredinia chiefly hypophyllous, scattered, or somewhat grouped on slightly discolored spots, bullate, the membranous epidermis tardily breaking away, pale, somewhat pulverulent, 0.5–0.8 mm. across; paraphyses and peridium none; urediniospores irregularly obovoid, 18–26 by 29–37 μ; wall colorless or nearly so, thin, 1–1.5 μ, moderately echinulate, pores not visible.

151. **Uredo globulosa** sp. nov.

Uredinia chiefly hypophyllous, numerous over the whole length of the leaf, 2–5 on well-defined, purplish-black spots, 0.5–1 mm. across, or singly without discoloration, bullate, in cross-section depressed-globose, 65–80 μ high by 150–325 μ broad, somewhat smaller when solitary; peridium usually deeply discolored, sharply delimiting the sorus from the rather loose leaf-tissue, opening by a central orifice, the cells polygonal, with walls about 2 μ thick; urediniospores stylosporic, broadly obovoid, 15–19 by 20–26 μ; wall colorless or nearly so, thin, about 1.5 μ, finely and closely echinulate, the pores obscure.

ON AMARYLLIDACEAE:

Hypoxis decumbens L., Las Marias, July 10, 1915, *8127* (type), Bandera, July 15, 1915, *8577*, *8630*.

This distinctive rust is especially notable by reason of the pedicillate spores borne in a delicate, sac-like peridium, which becomes filled with the detached spores, the whole structure lying

loosely in the tissues of the host, from which it is usually sharply defined by a deep stain. Careful search was made for telia, without success.

The same species of rust and on the same species of host was collected by E. W. D. Holway in Jalapa, Mexico, October 3, 1898, *3090*.

152. UREDO PIPERIS P. Henn., on *Peperomia hernandifolia* (Vahl) A. Dietr. (*Piperaceae*), Bandera, July 14, 1915, *8295*. The excellent material secured by Professor Stevens is placed under this Brazilian species with some hesitation, as the type has not been seen. The applicable description (Hedw. Beibl. 38: 70. 1899), and the close relationship of the two tropical host genera, *Piper* with its 600 species, and *Peperomia* with its 400 species, however, seem to warrant the use of the name. There is a *Uredo Peperomiae* P. Henn. from Brazil, which is a distinctly different fungus.

153. **Uredo Sauvagesiae** sp. nov.

Uredinia hypophyllous, grouped on blackish-purple spots, 1–3 mm. across, round, small, 0.1 mm. in diameter, ruptured epidermis prominent, dark cinnamon-brown, subepidermal; urediniospores ellipsoid or obovoid, 17–20 by 24–27 μ; wall cinnamon-brown, thin, 1–1.5 μ, closely and finely echinulate, the pores indistinct, probably two and equatorial.

ON OCHNACEAE:

Sauvagesia erecta L., Jejome Alto, July 17, 1915, *8376*.

The host is a common tropical plant occurring around the world. No rust has heretofore been reported upon it, or upon any member of the family. The sorus is of the usual applanate sort common to the *Aecidiaceae,* without paraphyses.

154. **Uredo Hameliae** sp. nov.

Uredinia epiphyllous, loosely grouped on indefinite, slightly paler and unthickened spots 1–1.5 cm. across, applanate, round, small, 0.2–0.4 mm. across, pale cinnamon-brown; urediniospores globoid or short obovoid, 15–21 by 19–24 μ; wall pale yellowish, thin, 1 μ, distinctly echinulate with points 1–1.5 μ apart, the pores uncertain, possibly 2 and equatorial.

ON RUBIACEAE:

Hamelia erecta Jacq. (*H. patens* Jacq.), Lajos, June 17, 1915.

The material shows good development of this rather inconspicuous rust. No closely related form is known. The host genus is American; the species extends from Mexico and the West Indies to Patagonia.

155. PUCCINIA FARINACEA Long, on *Salvia coccinea* B. Juss. (*Lamiaceae*), El Gigante, July 16, 1915, *8530*. The second time the host has been reported for this rust, the first collection of it being made in Texas in 1898.

CHANGE IN NAME AND ADDED DESCRIPTION

109*a*. **Schroeteriaster fenestrala** (Arth.) comb. nov.

Uredo fenestrala Arth., Mycologia 7: 332. 1915.

II. Uredinia, l. c.

III. Telia hypophyllous, abundant, scattered, or somewhat aggregated on yellowish, indefinite spots, punctiform, slightly elevated, dark or even blackish brown, 0.1–0.25 mm. across, subepidermal, lenticular, firm; teliospores imperfectly catenulate in chains of 2–4, closely compacted, oblong, 10–16 by 23–27 μ; wall light cinnamon-brown, thin, 1–1.5 μ, outer wall of terminal spores thicker, 3–5 μ, smooth.

ON EUPHORBIACEAE:

Phyllanthus grandifolius L., Martin Pena, Aug. 11, 1915, *9314*.

It is most fortunate that Professor Stevens was able this season to find more complete material of this interesting rust. The telia on the present collection, which consists of about twenty leaves, are abundant and well matured. They bear out the prediction, made in the introduction (p. 170), as to the genetic position.

ADDITIONAL HOSTS FOR PORTO RICAN SPECIES

15*a*. ARGOMYCES VERNONIAE Arth., on *Vernonia albicaulis* Pers., Bandera, July 15, 1915, *9048*. This makes the third species of host recorded for the rust.

18*a*. UROMYCES IGNOBILIS (Syd.) Arth., on *Sporobolus virginicus* (L.) Kunth, Camuy, Aug. 10, 1915, II, *9230*. A new host for this rust.

20*a*. UROMYCES SCLERIAE P. Henn., on *Scleria canescens* Boeckl., Jejome Alto, July 17, 1915, *8437*, El Alto, July 16, 1915, *8684*.

28*a*. UROMYCES PROEMINENS (DC.) Pass., on *Chamaesyce hypericifolia* (L.) Small, Lajas, June 18, 1915, *7171*.

34*a*. UROMYCES BIDENTIS Lagerh., on *Bidens pilosa* L., Arecibo and Lares Road, June 21, 1915, *7311*, Rio Piedras, Aug. 11, 1915, *9291*, Tanama river, July 6, 1915, *7899*, Maricao, July 20, 1915, *8979*.

38a. PUCCINIA CENCHRI Diet. & Holw., on *Cenchrus carolinianus* Walt., Camuy, Aug. 10, 1915, II, *9232*.

40*a*. PUCCINIA HUBERI P. Henn., on *Panicum fasciculatum* Sw., Tanama river, July 6, 1915, II, *7816*.

41*a*. PUCCINIA LEVIS (Sacc. & Bizz.) Magn., on *Paspalum fimbriatum* H. B. K., Cabo Rojo, July 29, 1915, II, *9074*.

42*a*. PUCCINIA SUBSTRIATA Ellis & Barth., on *Chaetochloa imberbis* (Poir.) Scribn., without locality, August, 1915, *9182*.

43*a*. PUCCINIA CANALICULATA (Schw.) Lagerh., on *Cyperus odoratus* L., San José Lagune, Aug. 10, 1915, *9223*, *9224;* Rio Piedras, Aug. 11, 1915; *9289; C. distans* L., without locality, 1915, *9192a*.

44*a*. PUCCINIA ELEOCHARIDIS Arth., on *Eleocharis flaccida* (Spr.) Urban, Bandero, July 15, 1915, II, *9045; E. mutata* (L.) R. & S., Guanajibo, June 19, 1915, II, *7198*, San José Lagune, Aug. 10, 1915, *9192*; *E. capitata* (L.) R. Br., San José Lagune, Aug. 10, 1915, *9227*, Martin Pena, Aug. 11, 1915, *9301*.

47*a*. PUCCINIA CANNAE (Wint.) P. Henn., *Calathea lutea* (Aubl.) Mey. (*Marantaceae*) Mayagüez, June 29, 1915, *7583*. The first record for a rust on this host.

67*a*. PUCCINIA LATERITIA Berk. & Curt., on *Spermacoce riparia* C. & S., Aquadilla, June 20, 1915, *7257*.

70*a*. PUCCINIA SYNDRELLAE P. Henn., on *Neurolaena lobata* (L.) R. Br., Florida Adentro, July 7, 1915, *7659*. The rust on this host, heretofore only known from Cuba, was also found by Mr. Percy Wilson in the phanerogamic herbarium of the New York Botanical Garden on a specimen from Panama, collected April 13, 1908, by R. S. Williams.

99*a*. UREDO GYMNOGRAMMES P. Henn., on *Adiantum latifolium* Lam., Las Marias, July 10, 1915, *8178*.

121*a*. UREDO ARTOCARPI B. & Br., on *Artocarpus Camansi* Blanco, without locality, August, 1915, *9179*. Some slight uncertainty exists regarding the host, as no flowers or fruit accompanied the material.

In order to make the foregoing rust flora of the West Indies more serviceable as a reference work an index has been prepared for the more than three hundred fungous names and the considerably more than four hundred host names.

INDEX TO UREDINALES OF THE WEST INDIES

New and newly combined names are in **bold face**

INDEX TO HOSTS

PURDUE UNIVERSITY, LAFAYETTE, INDIANA.

MYXOMYCETES FROM SOUTH AMERICA

William C. Sturgis

Our knowledge of the Myxomycetes of South America is comparatively meager. Spegazzini's numerous articles upon the fungi of Argentina, Brazil, Uruguay, and Paraguay[1] contain references to Myxomycetes and describe a number of new species, several of which, however, appear, on closer examination, to be referable to already known forms. R. E. Fries[2] has listed 47 species from Argentina and Bolivia. From Brazil, Berkeley and Curtis,[3] Hennings,[4] Jahn,[5] von Höhnel,[6] and Sydow[7] have published brief lists. Johow[8] mentions a few species belonging to this group in his Flora of Juan Fernandez, Chile. Ecuador is represented by a small number included by Patouillard and Lagerheim in their "Champignons de l'Équateur,"[9] while the former observer, in collaboration with Gaillard, reports 11 species of Myxomycetes in his "Champignons du Vénézuéla."[10] Although practically all parts of South America are represented in the publications of the above observers, the number of actual species of Myxomycetes listed is surprisingly small. It is therefore gratifying to be able to add materially to our knowledge in this field.

The following species were collected by Professor Roland Thaxter in Argentina and Chile in 1905–06. The collection is deposited in the Cryptogamic Herbarium of Harvard University, and it is through the courtesy of Professor Thaxter and Dr. W.

[1] Anal. Soc. Cient. Argentina, 1881, 1886, 1888; Bol. Acad. Nac. Ciencias, 1887, 1889; Rev. Facul. Agr. y Vet., 1896; Anal. Mus. Nac. Buenos Aires, 1899, 1909.

[2] Arkiv. f. Botanik, 1906.

[3] Journ. Linn. Soc., Botany, 1877.

[4] Hedwigia, 1896. Idem, Beiblatt, 1902.

[5] Ber. Deutsch. Bot. Gesellsch., 1902; Hedwigia, 1904.

[6] Denkschr. K. Akad. Wiss. Wien, 1907.

[7] Ann. Mycol., 1907.

[8] Estud. sobre la Flora d. l. Islas de Juan Fernandez, 1896.

[9] Bull. Soc. Myc. France, 1893.

[10] Bull. Soc. Myc. France, 1888.

G. Farlow that I have had the privilege of examining it and of reporting the results. It will be noted that, although the list includes several interesting species, it has happily been unnecessary to record any new species.

CERATIOMYXA FRUTICULOSA (Muell.) Macbr. Punta Arenas, Chile, March, 1906.

CERATIOMYXA FRUTICULOSA (var. FLEXUOSA List.). Corral, Chile, December, 1905. This extremely delicate form is interesting, but seems hardly worthy of even the varietal rank given it in the Lister Monograph.

BADHAMIA PANICEA (Fr.) Rost. Buenos Aires, Argentina, December, 1905. A somewhat scanty specimen, but fairly characteristic.

PHYSARUM GLOBULIFERUM (Bull.) Pers. Corral, Chile, December, 1905.

PHYSARUM DICTYOSPERMUM List. Punta Arenas, Chile, February, 1906. It is interesting to find this apparently very rare species in Chile. The only other recorded gatherings are from New Zealand, Switzerland and Australia. The specimen from Punta Arenas agrees in every particular with the description and figures furnished by Miss Lister, except that the slender, black stalks are somewhat longer (0.7 mm.) and the black columella is clavate and attains a height of one-half to two-thirds that of the sporangium. The specimen consists of about twenty sporangia growing on a mass of decayed vegetable matter.

PHYSARUM VIRIDE (Bull.) Pers. Concepcion, Chile, November, 1905; Corral, Chile, December, 1905.

PHYSARUM POLYCEPHALUM Schw. Temperley, Argentina, April, 1906. This is the typical form, with undulate, yellow sporangia, borne in clusters on fasciculate stalks.

PHYSARUM PENETRALE Rex. Corral, Chile, December, 1905. A fine gathering, which extends considerably the known range of this species in the southern hemisphere.

PHYSARUM BRUNNEOLUM (Phill.) Mass. Punta Arenas, Chile, March, 1906. An extraordinarily robust form of this species, occurring in fair abundance on decayed wood. The dirty-white or pale-tawny sporangia are borne on stout or slender reddish-

brown stalks, and measure 1.3 to 1.8 mm. in diameter. The thick, somewhat cartilaginous wall is densely charged with lime, and splits open in an irregular manner.

PHYSARUM STRAMINIPES List. Punta Arenas, Chile, February, 1906.

PHYSARUM DIDERMOIDES (Ach.) Rost. Buenos Aires, Argentina, April, 1906.

PHYSARUM NUTANS (Bull.) Pers. Corral, Chile, November and December, 1905.

PHYSARUM LATERITIUM (Berk. & Rav.) Morg. Corral, Chile, December, 1905. This specimen shows dark, orange-red lime-knots, instead of the yellow knots with red centers usually seen in this species. But the character of both capillitium and spores is that of *P. lateritium* rather than of *P. rubiginosum,* to which otherwise the specimen shows a very close resemblance. It is very doubtful whether these two forms can be regarded as distinct species.

FULIGO SEPTICA (Linn.) Gmel. Corral, Chile, December, 1905. Punta Arenas, Chile, February, 1906.

PHYSARELLA OBLONGA (Berk. & Curt.) Morg. Palermo Park, Buenos Aires, Argentina, March, 1906.

LEOCARPUS FRAGILIS (Dicks.) Rost. Punta Arenas, Chile, February, 1906.

DIDERMA HEMISPHERICUM (Bull.) Horn. Buenos Aires, Argentina, April, 1906.

DIDERMA SPUMARIOIDES Fr. Punta Arenas, Chile, February, 1906.

DIDERMA NIVEUM (Rost.) Macbr., subsp. LYALLII (Mass.). List. Punta Arenas, Chile, February and March, 1906. These gatherings are scanty and in rather poor condition, but the material is sufficient to warrant its reference as above. In both cases the whitish, densely calcareous sporangia are provided with stout, concolorous stalks, and show whitish, more or less clavate columellae.

DIDERMA TESTACEUM (Schrad.) Pers.? Punta Arenas, Chile, March, 1906. A single gathering, consisting of a few crowded, pulvinate sporangia, none of which are mature, is doubtfully referred to this species.

DIDERMA SIMPLEX (Schroet.) List. Punta Arenas, Chile, February, 1906. This is a single very large gathering consisting of thousands of closely crowded, sessile sporangia of a pale ochraceous-brown or tawny color, almost completely covering a mixed substratum of moss, dead leaves and twigs. A specimen submitted to Miss Lister was determined by her as above.

DIDERMA TREVELYANI (Grev.) Fr. Punta Arenas, Chile, February, 1906. As compared with numerous gatherings of this species made in the United States, this Chilean specimen shows a remarkable divergence in the size of the sporangia. These measure 1.5 mm. or more in diameter. In other respects, however, they are thoroughly characteristic of the species.

DIDERMA ANTARCTICA (Speg.) Sturgis. Punta Arenas, Chile, January, 1906. In 1887 Spegazzini[11] described as *"ad truncos cariosus Fagi antarcticae in silvis prope Punta Arenas,"* a species to which he gave the name *Licea antarctica.* This species, Miss Lister (Mon. Mycet., p. 264) refers doubtfully to *Perichaena corticalis* Rost. I have not seen the type of Spegazzini's species, but the published description makes it quite evident that it does not refer to a species of *Licea,* since it includes a distinct capillitium. The gathering made by Professor Thaxter and here recorded, consists of groups of ten to fifty or more closely aggregated, sessile sporangia, subglobose or angled by mutual pressure and with smooth walls of a dark reddish brown color. The thick wall, brittle above, persistent and cartilaginous below, is closely lined throughout with a delicate membranous layer densely beset with minute, snow-white granules of lime. The columella is a rough, indeterminate, calcareous mass of a pale yellow color. The capillitium consists normally of scanty, coarse or slender threads, dark in the middle, hyaline at the extremities; occasionally of large, pale-brown, membranous, angular expansions, from which the threads radiate. The spores, black in the mass, are dark purplish-brown, paler on one side, minutely spinulose and often marked with one or more raised bands, and measure 10.5–11.5 μ in diameter. That this description coincides very closely with that of *Licea antarctica* there can be no doubt. The probability that the two gatherings represent one and the same species is

[11] Fungi Patagonici. In Bol. Acad. Nac. Ciencias, Cordoba, 11: 56.

emphasized by the fact that both occurred on *Fagus antarctica,* and in precisely the same narrowly limited locality.[12] The specimen under consideration belongs in the *Leangium* group of the genus *Diderma,* and I feel justified in uniting with it the form recorded by Dr. Spegazzini.

DIACHAEA LEUCOPODA (Bull.) Rost. Buenos Aires, Argentina, October, 1905.

DIACHAEA LEUCOPODA var. GLOBOSA List. Punta Arenas, Chile, February, 1906. A remarkably fine gathering of this rare form, showing both stipitate and sessile sporangia.

DIDYMIUM CLAVUS (Alb. & Schw.) Rost. Llavallol, Argentina, April, 1906.

DIDYMIUM MELANOSPERMUM (Pers.) Macbr. Buenos Aires, Argentina, March, 1906.

STEMONITIS FUSCA Roth. Corral, Chile, December, 1905; Punta Arenas, Chile, February, 1906; Buenos Aires, Argentina, March, 1906.

STEMONITIS FUSCA var. DICTYOSPORA (Rost.). A fine gathering of this variety, showing an imperfect surface net and spores marked by raised bands forming a complete reticulation and a distinct border. In the size and habit of the sporangia this specimen is precisely like normal *S. fusca.* The absence of a surface net, and the spore-sculpture, however, connect it with Rostafinski's *S. dictyospora.* Miss Lister applies to this form the name *S. trechispora.* This name originated with Berkeley and first appears in connection with a specimen collected in Venezuela by Fendler. A portion of this gathering is in the Curtis Herbarium at Harvard University and bears the label "*Stemonitis trechispora,* B. & C." Under his *S. dictyospora,* Rostafinski (Mycet. Monog., App., p. 27) quotes three specimens, from Cuba, Ceylon, and Venezuela, respectively. The first-named was presumably the type of the species, but I find no record of the existence of this specimen. The second appears to be properly referable to *S. fusca* var. *rufescens* (cf. Lister, Mon. Mycet., Ed. 2, p. 145). The third is the gathering represented in the Kew, British Museum, and Curtis herbaria, and named by Rostafinski *S. dictyospora.* Although this specimen bears the manuscript name *S.*

[12] Professor Thaxter informs me that there is only one wooded area readily accessible from Punta Arenas.

trechispora, that name was never published and is discarded by Rostafinski except as a synonym for his *S. dictyospora.* Torrend (Fl. Myx., p. 141) disregards Rostafinski's authority in the matter and reverts to the earlier name, although the latter was evidently a *nomen nudum.* Massee (Mon. Myx., p. 84) rightly accepts the name *S. dictyospora* Rost. for the Venezuela specimen, while deploring the fact that Rostafinski did not see fit to validate the earlier name. It seems to me that Massee's conclusion is the only correct one, though I can not concur with him in giving to these banded-spored specimens anything more than a varietal position.

STEMONITIS SPLENDENS Rost. Punta Arenas, Chile, February, 1906; Palermo, Argentina, March and April, 1906.

STEMONITIS SPLENDENS var. WEBBERI (Rex) List. Punta Arenas, Chile, March, 1906.

STEMONITIS HERBATICA Peck. Palermo, Argentina, March, 1906.

STEMONITIS FERRUGINEA Ehr. Corral, Chile, December, 1905; Punta Arenas, Chile, February, 1906.

COMATRICHA NIGRA (Pers.) Schroet. Punta Arenas, Chile, February and March, 1906.

COMATRICHA TYPHOIDES (Bull.) Rost. Corral, Chile, December, 1905; Palermo, Argentina, March, 1906.

COMATRICHA TYPHOIDES var. HETEROSPORA Rex. Punta Arenas, Chile, March, 1906. A number of gatherings of this form show the same date and locality. In most of them the sporangia are of the usual narrowly cylindrical shape; some, however, exhibit tufts of rather dark sporangia, almost sessile, and measuring only 1.5 mm. in height by over 1 mm. in diameter. In these latter specimens the spores have a faintly reticulated surface, but the characteristic, scattered warts are barely, if at all, apparent. Such specimens evidently approach the dwarf forms of *Stemonitis fusca.*

ENERTHENEMA PAPILLATUM (Pers.) Rost. Punta Arenas, Chile, February, 1906.

CLASTODERMA DEBARYANUM Blytt. Corral, Chile, December, 1905. This rare species is represented by a single very large gathering in fine condition. It is typical in every respect.

CRIBRARIA MACROCARPA Schrad. Punta Arenas, Chile, March, 1906. A scanty gathering in poor condition.

CRIBRARIA SPLENDENS (Schrad.) Pers. Punta Arenas, Chile, February, 1906.

CRIBRARIA PYRIFORMIS Schrad. Punta Arenas, Chile, March, 1906.

DICTYDIUM CANCELLATUM (Batsch) Macbr. Punta Arenas, Chile, March, 1906. The single gathering of this common species included in this collection is a remarkable one. The sixty or more sporangia all show a very delicate, persistent, membranous wall, imparting to the sporangia a certain degree of iridescence. In most cases the wall is not thickened below to form a cup, but in others the cup is one-third to one-half the height of the sporangium and, in such cases, is marked with a network composed of lines of plasmodic granules, which network is continued in the upper part of the sporangium precisely as in the genus *Cribraria*. In fact, such sporangia present a remarkable resemblance to *C. pyriformis*. When the cup is absent, its place is taken by strong ribs, occasionally connected by delicate cross threads as in typical *Dictydium*, but usually anastomosing at acute angles below and forming a typical *Cribraria* net above, either with or without slightly thickened nodes. Such sporangia show a very near approach to *Cribraria splendens*. Only here and there in the gathering is to be found a sporangium the structure of which is throughout that of normal *Dictydium*.

TUBIFERA FERRUGINOSA (Batsch) Gmel. Punta Arenas, Chile, March, 1906.

DICTYDIAETHALIUM PLUMBEUM (Schum.) Rost. Corral, Chile, December, 1905. This is the gathering referred to by Miss Lister (Mon. Mycet., p. 196). The specimen is badly weathered, being detached entirely from the substratum, and showing only the persistent apices and characteristic lateral portions of the sporangia. The latter are peculiar in being unusually coarse (8–10 μ diam.); their length indicates that the aethalium measured 1.5 mm. or more in thickness; otherwise the specimen appears to be quite normal.

RETICULARIA LYCOPERDON Bull. Corral, Chile, December, 1905; Punta Arenas, Chile, 1906.

LYCOGALA FLAVO-FUSCUM (Ehr.) Rost. Llavallol, Argentina, April, 1906.

LYCOGALA EPIDENDRUM (Linn.) Fr. Corral, Chile, December, 1905; Punta Arenas, Chile, February, 1906.

TRICHIA FAVOGINEA (Batsch) Pers. Punta Arenas, Chile, February, 1905.

TRICHIA VERRUCOSA Berk. Corral, Chile, December, 1905; Punta Arenas, Chile, February, 1906.

TRICHIA AFFINIS D. By. Corral, Chile, December, 1905.

TRICHIA PERSIMILIS Karst. Concepcion, Chile, November, 1905.

TRICHIA DECIPIENS (Pers.) Macbr. Punta Arenas, Chile, February and March, 1906. These specimens vary considerably in general appearance from that usually presented. The sporangia are yellowish clay-colored, in some cases almost or quite sessile, and the upper half of the wall breaks away in an even line, leaving the lower portion as a well-defined cup. These crowded, nearly sessile sporangia bear a peculiar resemblance to those of *Cribraria argillacea*.

TRICHIA BOTRYTIS Pers. Corral, Chile, December, 1905; Punta Arenas, Chile, February, 1906.

TRICHIA BOTRYTIS var. MUNDA List. Corral, Chile, December, 1905.

HEMITRICHIA CLAVATA (Pers.) Rost. Corral, Chile, December, 1905.

ARCYRIA CINEREA (Bull.) Pers. Llavallol, Argentina, April, 1906.

ARCYRIA DENUDATA (Linn.) Sheldon. Corral, Chile, December, 1905.

ARCYRIA INSIGNIS Kalchbr. & Cke. Llavallol, Argentina, March, 1906. This specimen lacks the characteristic color, being weathered to a dull-yellowish-brown. In other respects it is typical.

ARCYRIA INCARNATA Pers. Concepcion, Chile, November, 1905; Punta Arenas, Chile, March, 1906.

MARGARITA METALLICA (Berk. & Br.) List. Punta Arenas, Chile, March, 1906.

CAMBRIDGE, MASS.

STUDIES IN PORTO RICAN PARASITIC FUNGI—II

Esther Young

In the May number of *Mycologia,* there appeared a report by the writer of this article which was the first of a series on Porto Rican Parasitic Fungi. A second article, by Mr. Garman, was published in the November number of *Mycologia.* This is the third of the series and is a report on the genus *Cercospora.* The work was done according to the method used in work reported in the first paper, when acknowledgments were made for valuable assistance rendered. The specimens were all collected by Dr. F. L. Stevens during the years 1912 and 1913 and the material is in the herbarium of the University of Illinois.

1. Cercospora conspicua Earle, Bull. N. Y. Bot. Gard. 3: 312. 1904

On leaves of *Cleome* in Porto Rico: Mayagüez, *6728; ——, 19.*

2. Cercospora portoricensis Earle, Muhlenbergia 1: 15. 1901

On leaves of *Piper hispidum* in Porto Rico: Maricao, *4792, 4802;* Rosario, *4804.*

3. Cercospora Cajani P. Henn. Hedwigia 41: 309. 1902

On leaves of *Cajanus indicus* in Porto Rico: Aquas Buenas, *294;* Aquada, *5100;* Maricao, *4832;* Anasco, *3556;* Dos Bocas below Utuado, *6572, 6058, 6029;* Guayanilla, *5874;* Luguillo Forest, *5608;* Hormigueros, *226;* Monte de Oro, *5735.*

4. Cercospora Vaginae Kreuger, Walker & Went. Mededeel. Profest. Suiker. West-Java 24: 8. 1896

On leaves of *Saccharum officinalis* in Porto Rico: Johnston *7001.*

5. CERCOSPORA MUCUNAE Syd. Bibl. Hedwigia 42: 136. 1903

On leaves of *Mucuna pruriens* in Porto Rico: Anasco, *3601;* San German, *250; Utuado, 4685, 4691;* Dos Bocas below Utuado, *6555, 6009;* Mayagüez, *3951;* Anasco, *3535;* Rosario, *3779, 4704;* Monte Alligrillo, *4779;* Rosario, *4806;* Utuado, *4929*.

6. CERCOSPORA ROSICOLA (Pass.) Sacc. Fungi Ital. *pl. 665*

On leaves of *Rosa* in Porto Rico: Maricao, *3447, 737, 4806*.

7. CERCOSPORA BLOXAMI Berk. & Br.

Spots spherical to ovate, 2–5 mm. in diameter, sordid-white to yellowish-brown, margin slightly darker; conidiophores fasciculate, simple, fuscus, paler at the tips, conidial scars evident, 1–2-septate, $75.6–162 \times 5.4–7.2\,\mu$; conidia elongate-fusiform, acuminate at one end, 5–7-septate, hyaline, $50.4–144 \times 2.7–3.6\,\mu$.

On leaves of *Brassica rapae* and *B. napi* in Porto Rico; Quebradillos, *5121;* Bayamon, *449*.

This differs from *C. Armoraciae* and *C. brassicola* in size and shape of conidia, and in size of conidiophores.

The original description of *Cercospora Bloxami* on *Brassica* is very meager, lacking in many of the essential characters and measurements. The present emended description is drawn from the Porto Rican specimens.

8. CERCOSPORA HYDROPIPERIS (Thüm.) Speg. Anal. Soc. Sci. Argent. 1: 191. 1867

Helminthosporium Hydropiperis Thüm. Myc. Univ. n. 1087.
Cercospora Polygonorum Cooke, Hedwigia 17: 39. 1878.

On leaves of *Polygonum punctata* in Porto Rico: Utuado, *4586, 4578;* Coamo, *91;* ——, *91;* Corozal, *419;* Ciales, *27;* Mayagüez, *1154*.

9. CERCOSPORA LEPIDII Peck, Ann. Rep. N. Y. State Mus. 35: 140. 1884

On leaves of *Lepidium* sp. in Porto Rico: Mona Island, *6352*.

10. CERCOSPORA HIBISCI Tracy & Earle, Bull. Torrey Club **22**: 179. 1895

On leaves of *Hibiscus tiliaceus* in Porto Rico: Rosario, *3793;* Las Marias, *310;* Dos Bocas below Utuado, *6618*, *6564;* Maricao, *4797;* Rio Maricao above Maricao, *3630.*

11. CERCOSPORA PHYLLITIDIS Hume, Bull. Torrey Club **27**: 577. 1900

On leaves of *Polypodium* sp. in Porto Rico: Barros, *121.*

12. CERCOSPORA AMARYLLIDIS Ellis & Ev. Jour. Myc. **3**: 14, 1887

On leaves of *Hymenocallis* sp. in Porto Rico: Santurce, *244;* Coamo, *836.*

13. CERCOSPORA DENSISSIMA Speg. 1899

On leaves of *Sida* sp. in Porto Rico: Mona Island, *6361*, *6354.*

14. CERCOSPORA CASSAVAE Ellis & Ev. Bull. Torrey Club **22**: 438. 1895

On leaves of *Cassava* sp. in Porto Rico: Dos Bocas below Utuado, *6557.*

Our material differs slightly from the description in that the conidiophores are longer, and sometimes septate, and are brown in color with hyaline tips.

15. CERCOSPORA CHAMAECRISTAE Ellis & Kellerman, Jour. Myc. **4**: 7. 1888

On leaves of *Cassia occidentalis* and *C. alata* in Porto Rico: Dos Bocas below Utuado, *6054;* Santurce, *269a;* Anasco, *3586;* Mayagüez, *1276.*

In our specimens, the host *C. occidentalis* has a definite spot; the length of the conidiophores is slightly different from the description, being as long as 216 μ; conidia usually 3–5-septate.

16. **Cercospora maricaoensis** sp. nov.

Spots diffuse, brown, scattered over the leaf, amphigenous, more numerous below; conidiophores often branched, loosely fascicu-

late, septate, pale-olivaceous, 54–144 × 5.4–7.2 μ; conidia oblong-cylindrical, hyaline, sometimes slightly curved, 3–5 septate, 36–81 × 3.6–5.4 μ.

On leaves of *Teramnus uncinatus* (L.) Sw. in Porto Rico: Maricao, *764;* Dos Bocas below Utuado, *6554* (type); ——, *5815;* Cabo Rojo, *2271.*

17. **Cercospora boringuensis** sp. nov.

Spots definite, amphigenous, reddish-brown, varying from spherical to irregular, often coalescing and forming large, brown patches on the leaves; conidiophores fasciculate, simple, septate, brown, 72–144 × 3.6–5.4 μ; conidia clavate, slightly curved, hyaline, 3–7-septate, 36–54 × 5.4–7.2 μ.

On leaves of *Calapogonium orthocarpum* Urban in Porto Rico: Mayagüez, *6752* (type).

18. **Cercospora Stevensii** sp. nov.

Spots amphigenous, reddish-brown above, black below, 1–2 mm. in diameter; conidiophores densely fasciculate, simple, cylindrical, brown, septate, some peculiarly twisted; conidia hyaline, oblong-cylindric, often slightly curved, septate, granular, 32.4–72 × 3.6–6.3 μ.

On leaves of *Andira* sp. in Porto Rico: Dos Bocas below Utuado, *600* (type), *6549.*

19. **Cercospora guanicensis** sp. nov.

Spots amphigenous, spherical to ovate, yellow to greenish-brown above, reddish-brown below, conidiophores, densely fasciculate, septate, unbranched, 76–96 × 4.8 μ; conidia oblong-cylindric, subhyaline, slightly curved, 3–6-septate, granular, 39.6–96 × 3.6–7.2 μ.

On leaves of *Guilandina crista* in Porto Rico: Guanica, *6840* (type), *6845.*

Associated with this is a species of *Dothidella.*

20. **Cercospora Malachrae** sp. nov.

Spots amphigenous, spherical, 2–5 mm. in diameter, scattered, the centers white, surrounded by a black, slightly elevated margin, the portion of the leaf about the spot reddish-purple to purplish-black, often large areas infected; conidiophores fascicu-

late, dark-brown, few septate, 63–144 × 3.6–5.4 μ; conidia hyaline, cylindrical, 90–108 × 3.6 μ.

On leaves of *Malachra rotundifolia* in Porto Rico: San Sebastian, *5199* (type); Ponce, *5003;* Guanica, *338a;* Yauco, *3246;* San German, *5840;* Vega Baja, *431, 381.*

21. **Cercospora Bradburyae** sp. nov.

Spots amphigenous, varying from definite, spherical, 1–2 mm. in diameter to diffuse, yellowish-brown to rusty-red; conidiophores densely fasciculate, simple, fuscus, 12–36 × 3.6–4.8 μ; conidia elongate-cylindrical, hyaline, 5–7-septate, 48–96 × 2.4–3.6 μ.

On leaves of *Bradburya pubescens* in Porto Rico: Mayagüez, *6296, 3930, 479;* Luguillo Forest, *5609;* Dos Bocas below Utuado, *6558;* San German, *5796, 5833, 5785;* Guayama, *5412;* Jayuya, *446a;* Hormigueros, *225a;* Caba Rojo, *6482;* Rosario, *446* (type).

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INDEX TO ILLUSTRATIONS OF FUNGI I–XXII

William A. Murrill

This series of twenty-two illustrated articles on the larger fungi was begun with the first volume of *Mycologia* in 1909 and has been continued regularly each year since. During this time, 184 species have been described and figured, 27 of them from photographs and the remaining 157 from water-color paintings prepared by Mr. Edward C. Volkert. The specimens used have been mostly collected in the vicinity of New York City, but a few came from Massachusetts. Many important edible and poisonous fungi have been included in the treatment.

NEW YORK BOTANICAL GARDEN.

NOTES AND BRIEF ARTICLES

Excellent specimens of *Polyporus amorphus* collected at State College, Pa., by C. R. Orton were sent to the Garden herbarium in a fresh condition by Mr. L. O. Overholts on September 22. They were found growing on dead pine wood and running over pine needles on the ground. The species has no doubt been confused with *P. dichrous* in this country.

A specimen of the rare *Panaeolus epimyces* on *Coprinus comatus* was sent in from Pittsford, New York, on October 25, 1915, by Mr. Fred S. Boughton, and a colored drawing of the plant was obtained. The host was turbinate in general outline and depressed about the stipe of the *Panaeolus,* resembling the enlarged base of an *Amanita* with a conspicuous, thickened volva. Attention is called to Mr. E. T. Harper's article in MYCOLOGIA 5: 167. 1913, and to the papers he cites on this subject.

Auricularia Auricula (L.) Underw., commonly known as the Jew's ear fungus, has been studied by M. J. Le Goc in the vicinity of Cambridge, England, where it is common on elder and less common on elm. Pure cultures of the fungus grow readily on elder, lime, and elm wood, producing rudimentary fructifications. Penetration, delignification, and almost complete consumption of the wood quickly follow natural infection with the fungus. Inoculations on healthy living twigs of elder were often successful, the hyphae penetrating slowly at first, but finally killing the twigs.

A collection of Thelephoraceae made in Jamaica in 1908 and 1909 by W. A. Murrill and Edna L. Murrill has recently been determined by Dr. E. A. Burt, who is publishing a series of articles on this family in the *Annals of the Missouri Botanical Garden.* Of the 45 species recognized, representing 12 genera, 8 of them are new and some of the more difficult material in the col-

lction remains to be investigated. *Cyphella porrigens* Burt, Ann. Mo. Bot. Gard. 1 : 368. 1914, and *Thelephora magnispora* Burt, Ann. Mo. Bot. Gard. 1: 211. 1914, were described from this collection.

A box of miscellaneous fleshy and woody fungi from Alberta, containing nearly 100 specimens collected last season in the vicinity of Banff by Mr. N. B. Sanson, Curator of the Dominion Government Museum, has recently been sent to the Garden herbarium. Among the species in this collection are: *Armillaria evanescens, Ceriomyces viscidus, Clavaria pistillaris, Coprinus comatus, Coriolus pubescens, Corticium pezizoideum, Cortinellus vaccinus, Hydnum imbricatum, Melanoleuca melaleuca, Pholiota candicans, Rostkovites granulatus, Scutiger Whiteae, Dasyscypha arida, Geopyxis vulcanalis, Helvella crispa, Herpotrichia nigra, Hypocrea Richardsoni, Morchella crassipes,* and *Otidea Auricula.*

It is interesting to observe the gradual addition of new elements in the fungous flora of the Garden as the introduction and development of new shrubs and trees prepares the way for them. Several years ago, a single hymenophore of *Boletus luteus* was found under a young pine tree east of the large range of public conservatories. The past autumn, about the middle of October, a large basketful of very fine specimens was gathered there and many more were found under the pines to the north of the range. When Dr. Murrill collected on the Tacoma Prairies in Washington, he found an interesting series of fungi which had been introduced after the land was occupied by scattered clumps of conifers.

Studies in the Agarics of Denmark, by Jakob E. Lange, are appearing in parts in the *Dansk Botanisk Arkiv.* Part 1 appeared in 1914 in the first volume of this periodical and included a general introduction and a treatment of the genus *Mycena.* Part 2 appeared in 1915 and included *Amanita* (14 species), *Lepiota* (31 species), and *Coprinus* (33 species), with keys and descriptions of all species and two plates of illustrations. The author considers *Amanitopsis* a subgenus of *Amanita* and *Armillaria* a

subgenus of *Lepiota,* while *Psathyrella disseminata* and *P. impatiens* are transferred to *Coprinus,* following the opinion of Quélet. Three new species, *Lepiota Cortinarius, Coprinus Hansenii,* and *Coprinus bisporus* are described in this part.

A separate from the report of the New York State Botanist for 1914 giving keys and descriptions of the species of *Marasmius* occurring in the state appeared in December, 1915. This paper was prepared by Professor L. H. Pennington, of Syracuse University, whose work on the species of *Marasmius* occurring in temperate North America appeared in Volume 9, part 4, of *North American Flora,* issued in April, 1915. Dr. Pennington reported 71 species of this genus from temperate North America and his list of species from New York includes 61 species. This means that there are still many undescribed species in other states to be discovered and published. Species of *Marasmius* aid greatly in the formation of humus, and they very rarely cause plant disease. The common fairy ring fungus, *Marasmius caryophylleus,* is a weak parasite of grasses, and this species is practically the only one in the genus which is used for food.

A very interesting and important list of the fungi of North Elba, New York, which contains many additions to Peck's list of North Elba plants published in 1899, appeared in December, 1915, as a separate from the report of the state botanist for 1914. This list was prepared by Professor C. H. Kauffman, of the University of Michigan, after three weeks' collecting in the vicinity of Newman in September, 1914, assisted by Mr. E. B. Mains, who gave special attention to the rusts and ascomycetes. The region covered was small, but the season was unusually good. Two new species are published in this paper, *Boletus rubritubifer* Kauffm., found under spruce trees, and *Cortinarius chrysolitus* Kauffm., found in a sphagnum swamp under balsam trees.

The chestnut canker is reported in at least two localities in Nebraska, having been shipped there with nursery stock. The effect of the canker on chinquapin in Virginia is being observed

and studied by Rogers and Gravatt, who find by inoculations that this tree is no less resistant than the chestnut, but, being less subject to insect attacks and other injuries, it enjoys greater freedom from the disease in the field. The chinquapin grows very poorly in the latitude of New York City, but the few plants observed here show a marked resistance to the canker. Among the new plant introductions ready for distribution by the Bureau of Plant Industry, are the Chinese chestnut, *Castanea mollissima,* collected in northern China where the canker has probably existed for centuries; and a hybrid between the American chinquapin and the Japanese chestnut produced at Chico, California, by Dr. Walter Van Fleet. Both of these trees are said to be, as one would expect, highly resistant to the canker.

The annual report of the New York State Botanist for 1914, distributed as Museum Bulletin 179, was issued in December, 1915. Two mycological contributions to this report, by Dr. Pennington and Dr. Kauffman, were issued separately in advance and have been noted above. Descriptions of many new and interesting species of fungi are contributed by Dr. Homer D. House, now State Botanist, among which are the following:

New species by Dearness and House: *Aecidium lini, Cercospora argythamniae, C. namae, Cylindrosporium spigeliae, Laestadia galactina, Macrophoma celtidicola, M. peckiana, Phyllosticta baccharidis, P. maurandiae, P. medeolae, P. oakesiae, P. pachysandrae, P. rhexiae, Placosphaeria celtidis, Ramularia delphinii, Septoria darlingtoniae, S. erythraeae, S. tinctoria,* and *Thyridium ceanothi.*

New names and combinations: *Hebeloma peckii* House, nom. nov., *Melanopsamma waghornei* House, nom. nov., and *Phyllosticta raui* Dearness and House, comb. nov.

While collecting cacti in South America last year, Dr. J. N. Rose picked up a number of fungi which are of special interest as indicating the close connection existing between the flora of tropical North America and that of Brazil. He obtained about 100 numbers; most of them in the mountains about Rio de Ja-

neiro, while a few came from Argentina. Only one desert form was found, a species of *Tylostoma,* represented by a single sporophore. A few of the forest forms are listed below:

Auricularia Auricula, Chlorosplenium aeruginosum, Cladoderris dendritica, Coriolopsis occidentalis, Coriolus haedinus, C. membranaceus, C. pinsitus, C. sector, Daedalea amanitoides, Elfvingia tornata, Elfvingiella fasciata, Favolus variegatus, Fomitella supina, Hapalopilus gilvus, Hexagona daedalea, Lentinus crinitus, L. strigosus, Panaeolus campanulatus, Pogonomyces hydnoides, Psathyrella disseminata, Pycnoporus sanguineus, Resupinatus subbarbatulus, Rigidoporus surinamensis, Schizophyllus alneus, Simblum sphaerocephalum?, Stereum bicolor, and *S. lobatum.*

A New Family of Hymenomycetes

The genus *Porothelium,* erected by Fries in 1818 on *Boletus fimbriatus* Pers. and one other species, is out of place among the Polyporaceae because of its spiny hymenium and cannot properly be included in the Hydnaceae because its spines are hollow and bear spores on their inner surface. The new family **Porotheliaceae** is therefore proposed to include hymenomycetes having the hymenium composed of tubular teeth, the context being similar in general to that found in the two related families, the Polyporaceae and the Hydnaceae. The name of the genus on which this family is based was originally written *Porotheleum* (Fries, Obs. Myc. 2: 272. 1818), but was soon afterwards changed to the form now in current use.

W. A. MURRILL.

A New Genus of Resupinate Polypores

Xanthoporia gen. nov.

Hymenophore annual, epixylous, resupinate; subiculum membranous, dirty-white; tubes long, angular, thin-walled, at first whitish, soon colored by the spores, which are yellow, smooth, ovoid, copious; spines few, at first conic, then elongate.

Type species: *Mucronoporus Andersoni* Ellis & Ev.

Xanthoporia Andersoni (Ellis & Ev.)

Mucronoporus Andersoni Ellis & Ev. Jour. Myc. **6**: 79. 1890.
Polyporus xanthosporus Underw. Proc. Ind. Acad. Sci. **1893**: 61. 1894.

This interesting species was first described from specimens collected by F. W. Anderson under the bark of an oak log at Newfield, New Jersey, in April, 1890. Owing to its peculiar habitat, the plant is rarely found, although the copious yellow spores, which sift through cracks in the bark and cover surrounding objects, had probably been known for some time.

In October, 1893, Underwood collected this species in quantity beneath the bark of dead poplar logs near Terre Haute, Indiana, describing it as *Polyporus xanthosporus*. The following June it was found on an oak trunk near Emma, Missouri; and in December, 1895, C. G. Lloyd collected it on a dead elm or poplar log near Cincinnati, Ohio.

W. A. MURRILL.

FINK'S ASCOMYCETES OF OHIO

A treatment of the ascomycetes of Ohio is begun in Volume 2, No. 1, of the *Ohio Biological Survey*. The work has been undertaken by Professor Bruce Fink and collaborators, of Miami University.

The first part of this work consists of a preliminary discussion of the classification of the ascomycetes. After a rather full discussion of the morphology and the various theories relating to the origin of the ascomycetes, a tentative scheme is proposed for the taxonomic treatment of the ascomycetes of Ohio. While the work is undertaken as a local matter, the principal orders and families of the ascomycetes are considered so that the scheme with some modification will apply equally well in a much broader sense to the ascomycetes of North America.

It is worthy of note that in this scheme Fink has followed the modern trend of thought in disposing of the lichens by distributing them among the true fungi. In many cases they are simply disposed of in large groups, each order or family being placed in its proper place among the orders and families of fungi. Some

lichen genera are still further distributed by infiltrating them into existing families of fungi.

The second part of the work consists of a treatment of the Collemaceae of Ohio. Sixteen species of the family are recognized for Ohio, three of which are described as new.

This and similar lists are not only of local value but are also of inestimable value to the student of North American ascomycetes, especially those who are concerned with monographic work on the various groups of ascomycetes for *North American Flora.*

F. J. SEAVER.

TESTIMONIAL TO PROFESSOR CHARLES HORTON PECK

The friends and colleagues of Professor Peck, who recently retired from the position of New York State Botanist after nearly fifty years of service, have expressed a wish to commemorate his important labors in the field of mycology by placing in the new rooms of the New York State Museum an exhibit of reproductions of the edible and poisonous fungi of New York. The preparation of this series has been assigned to Mr. Henri Marchand, whose reproductions from nature, both in structural detail and in coloring are of extraordinary beauty and fidelity, and twelve clusters of fungi have already been completed. It is desirable to finish the work this winter, as preliminary casts have already been prepared of a large number of subjects. Contributions to this very worthy and important undertaking may be sent to Dr. John M. Clarke, Director, State Museum, Education Building, Albany, N. Y.

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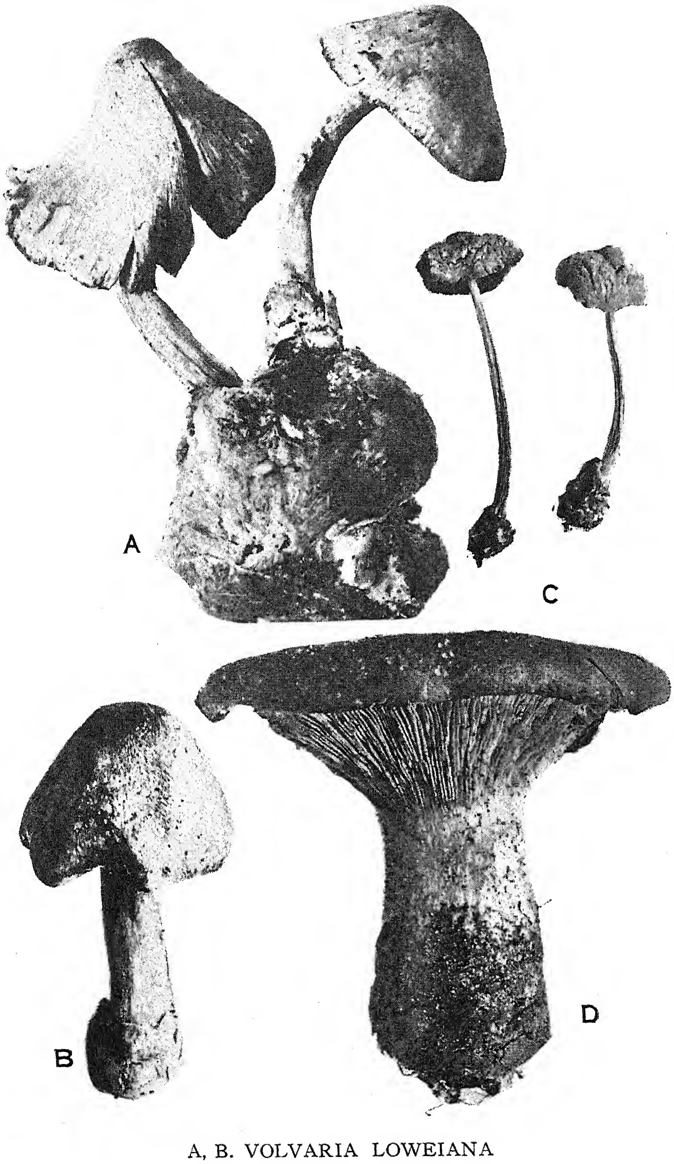

A, B. VOLVARIA LOWEIANA
C. VOLVARIA PLUMULOSA
D. CLITOCYBE NEBULARIS

MYCOLOGIA

VOL. VIII MARCH, 1916 No. 2

TWO PARASITIC MUSHROOMS

EDWARD T. HARPER

(WITH PLATES 177–179, CONTAINING 14 FIGURES).

VOLVARIA LOWEIANA (Berk.) Pat.

Specimens of this parasite on *Clitocybe nebularis* were found by a member of the Minnesota Mycological Society in the autumn of 1915 and sent to me by the president of the Society, Dr. Mary S. Whetstone. Several collections both of the parasite and the uninfected host plant were received, from which the accompanying photographs were made. The plants grew in an area about ten feet square on the ground among leaves about a cluster of waxberry bushes. The host mushrooms had been collected from this locality and eaten for four years, but the parasite did not appear until the present season.

The host plants are deformed by the parasite and become irregular masses, like the so-called abortive forms of *Clitopilus abortivus* and *Armillaria mellea.* Whether their structure is similar to that of the host of *Pilosace algeriensis* described below could not be determined from my specimens. The illustrations of the European plants show less malformation of the host. The *Volvaria* appears as small, white, spherical bodies on the pileus of the host and has a normal development like that of *Volvaria bombycina.*

The specimens agree in all essential characters with Maire's description in the Bull. Soc. Myc. de France, Tome XXVII, fasc. 4, and I can add little from my material. The spore measure-

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ments agree with those given by Maire, $4–5 \times 6–7\,\mu$, much larger than those reported in the Sylloge, by Stevenson, etc.

Pileus 1–2 inches broad, ovoid or globose, becoming companulate and expanded, obtuse, broadly umbonate, villous-silky, dry, not striate, fimbriate on the involute margin, white; flesh solid, white or with a tinge of pink; lamellae slightly ventricose, attenuated in each direction but somewhat broader in front, free, white-floccose on the edges, becoming pink and finally reddish with spores; stem about 2 inches long, 2–3 lines thick, slightly bulbous at the base, equal or somewhat attenuated upward, solid, white, fibrillose; volva white, covering the bulbous base of the stem, free margin short, lobed; spores pink to reddish in mass, ovoid or ellipsoid, $4–5 \times 6–7\,\mu$, membrane thick, vacuoles one or two; basidia club-shaped, enlarged below the apex, $7 \times 30\,\mu$, contents granular; cystidia numerous especially on the edges of the lamellae, ventricose, accuminate above with a cylindrical obtuse apex, $8–15 \times 45–70\,\mu$.

Parasitic on *Clitocybe nebularis*.

Quélet considered *Volvaria Loweiana* as a luxuriant parasitic form of *Volvaria plumulosa* Lasch. The latter grows on the ground among humus in fir woods. Maire, who has studied both forms, agrees as to the identity of the two species, though he finds some minor differences between them. The most important difference is that the spores of *Volvaria plumulosa* are a little broader and shorter than those of *Volvaria Loweiana* but, as both Patouillard and Britzelmayr give the spore measurements of *Volvaria plumulosa* fully as long as those of *Volvaria Loweiana*, he concludes that the size of the spores may be variable. Maire gives photographs of both the parasitic and terrestrial form. The group includes *Volvaria Loweiana* (Berk.), *Volvaria plumulosa* (Lasch), *Volvaria parvula* var. *major* Wein., and *Volvaria hypopitys* Fries.

I collected plants of this group on the ground under coniferous trees at Frankfort, Mich., in August, 1911, but did not secure a photograph of the fresh plants. The dried specimens are shown in *pl. 177, f. C*. They agree with *Volvaria plumulosa* as described and illustrated by Maire. The plants were white with a villous, silky pileus, even, not striate on the margin. The stem was silky-fibrillose, solid, slightly bulbous at the base, where it was covered

by the white volva. The plants were less robust and a little smaller than *Volvaria Loweiana.* Most of the spores were 4–5 × 5–6 μ agreeing with Maire's observation though many spores 7 μ in length were to be found. The basidia and cystidia in the two plants agreed exactly, which is especially significant in the case of the cystidia which have a peculiar shape. The plants are certainly closely related, though cultures would be necessary to prove their identity. This would be difficult to accomplish with such rare plants. Worthington Smith succeeded in growing *Volvaria Loweiana* on *Clitocybe nebularis.*

The limits of the group in this country are not well fixed. Several forms should be kept in mind by collectors.

1. *Volvaria villosa-volva* Lloyd, Myc. Notes **4**: 31 and photograph No. 81. The plants were found among dead leaves of deciduous trees and had the volva overgrown with white, myceloid hairs. Otherwise they agreed with *Volvaria plumulosa,* as they had an even pileus and solid stem. The spores are said to be globose, 5 μ in diameter. The white, myceloid base of the stem is not remarkable in plants growing among dead leaves.

2. *Volvaria umbonata* Pk. Bull. Torrey Club **26**: 64–65. 1899. The species was based on plants found in Ohio by Lloyd, which grew in lawns and grassy places. It is illustrated by Hard, *Fig. 194,* who found it not uncommon at Chillicothe, Ohio. The species is distinguished from *Volvaria plumulosa* by its striate and slightly viscid pileus. In these respects, it agrees with *Volvaria parvula* Wein., from which it differs in the solid stem. The spores are 4–5 × 5–7 μ exactly like those of *Volvaria Loweiana* and the other members of the group. Peck considers *Volvaria umbonata* as akin to *Volvaria media* but distinguished by the larger spores. The reports of the spores of *Volvaria media* may, however, be incorrect.

3. *Volvaria pusilla* Pers. It has often been reported from this country and is considered the same as *Volvaria parvula* Wein. The pileus is striate and viscid and the stem hollow, so that it represents the opposite extreme of the group from *Volvaria Loweiana.* It is also the smallest member of the group. The spores and basidia are characteristic of the group, as are in all

probability the cystidia also, the measurements of which are given in the Sylloge as 6–7 × 50–55 μ.

All the members of the group agree in their fruiting bodies and in general appearance and color. They differ in various combinations of the characters, solid or hollow stem, even or striate pileus, and dry or viscid surface. *Volvaria Loweiana* is a case where parasitism has resulted in robust and luxuriant growth.

Volvaria Loweiana was collected by Prof. John Dearness at London, Ontario, Canada, in October, 1896, and distributed in North Amer. Fungi, No. 3509. In my specimen, the spores of the parasite are 4–5 × 6–8 μ. No part of the host is present, but it is said to grow parasitic on *Clitocybe*. Prof. Dearness informs me that the host is *Clitocybe nebularis* and that the spores of the host measure about 2.75 × 5 μ. He never found it on any other species. Lloyd's note in *Volvae* that *Volvaria Loweiana* was found on *Clitocybe monodelpha* is an error.

The host plant, *Clitocybe nebularis,* is very widely reported from both Europe and America, but the limits of its group are not well understood. Peck confines the species to plants with small spores, 2–3 × 4–5 μ, and reports it as rare in New York State, having been found in only two or three localities. He illustrated it in Ann. Rep. N. Y. State Mus. **48**: *pl. 23, f. 8–13.* Murrill in Mycologia, Sept. 1915, p. 268, says the spores of the European plant are 5–7 × 8–10 μ and that Peck's illustrations are not suggestive of the European form.

There were two forms of the host of *Volvaria Loweiana,* both growing in the small area where the parasite was found. One is shown in *pl. 178, f. A, B.* The pileus was convex, whitish or with a slight tint of yellow, covered with a slight pruinosity, and often disfigured by dirt and humus. The lamellae were decurrent, adnate or even sinuate when young, becoming long-decurrent when mature. The stem was short, much thickened and often curved at the base. The spores were small, 3–4 × 5–6 μ. The plants agree with the figures of Gillet and Britzelmayr except that the stems are shorter. Britzelmayr gives the spore measurements as 4 × 6–8 μ. The second form is shown in *pl. 177, f. D.* It had a more equal stem gradually tapering upward, and the pileus was dark-smoky-gray. The spores were slightly smaller than in the

first form, $2–3 \times 4–5\ \mu$. They agree with Peck's measurements, and also with those given in the Sylloge, $2.5–3 \times 4–5\ \mu$, and by Stevenson, 3×4 or $3 \times 3–5\ \mu$. The plants also agree with Peck's illustration and in general with that of Massee in British Fungi and Lichens.

A very closely related group is that which contains *Clitocybe robusta* and *Clitocybe nobilis* of Peck, *Clitocybe candida* of Bresadola, and, in Quélet's opinion, also *Paxillus Lepista.* These plants, as I have seen them growing among leaves in open woods in Wisconsin, can scarcely be distinguished from the form of *Clitocybe nebularis* shown in *pl. 178, f. A. B.* They have a thick, white, convex to depressed pileus. The lamellae are adnate or sinuate to long-decurrent. The stems are usually short with much enlarged, often curved bases. The spores are, however, larger, $4–5 \times 7–9\ \mu$ in my specimens, $4–5 \times 6–8\ \mu$ and often slightly ochraceous in *Clitocybe robusta,* $4–5 \times 7–8\ \mu$ in *Clitocybe nobilis,* and $3 \times 7\ \mu$ in *Clitocybe candida.*

PILOSACE ALGERIENSIS (Fries) Quél.

In *Mycologia,* May, 1913, pp. 167–169, I gave reasons to show that the mushroom parasitic on species of *Coprinus* and described in this country as *Panaeolus epimyces* Peck and *Stropharia coprinophila* Atk. was the same as that illustrated by Lanzi, Fung. Mang, *pl. 67,* and identified as *Pilosace algeriensis.* During the past season, Dr. Mary S. Whetstone sent me several specimens of the plant found near Minneapolis, Minn., and from them I secured the photographs in *pl. 178, f. C, D and pl. 179, f. A.* A comparison with Lanzi's *pl. 67, f. b, c, d,* leaves no doubt that his specimens were parasites and the description proves their identity with the species before us. The lamellae of the parasite become wholly free from the stem as the pileus expands. The substance of the stem is not continuous with that of the pileus as can be seen in *pl. 179, f. A,* and the pileus easily separates from the stem. The plant has a universal veil which leaves the pileus and the base of the stem scaly, but there is no evident volva or annulus. The spores have a purple or brownish tinge rather than clear black. Hence the species is more naturally placed in *Pilosace* than in *Panaeolus* or *Stropharia* as was recognized by Fries, Quélet, and

Lanzi. *Pilosace algeriensis* appears to be very rare in Europe. Prof. Maire informs me he has never seen the species.

In addition to what has been said about the species by Peck, Atkinson, McKenna, Miss Sherman, and in my former article, some points regarding the effect of the parasite on the host plant are shown in these illustrations.

The carpophores of the parasite grow from the center of the pileus of the host either singly or in clusters. A comparison with the normal forms of the host, *pl. 179, f. C, D,* shows that the parasite has prevented the natural elongation of the stem. In very young carpophores of *Coprinus,* before the stem has begun to elongate, the gill chambers open outward and more or less downward with their bases and outer ends in the substance of the pileus, and their inner ends in that of the stem, although the exact point where the stem ends and the pileus begins, is somewhat arbitrary at this early stage of development. The mouths of the chambers are closed by the tissue of the veil, which is continuous with the trama of the gills. This is seen in Levine's figures of the young stages of *Coprinus micaceus,* Amer. Jour. Bot. **1**: *pl. 39, f. 13–14* and *pl. 40, f. 9.* I have no photographs of the young stages of *Coprinus,* but the sections of *Agaricus arvensis, pl. 179, f. E, F,* are similar in the position of the young gill chambers. In *f. E,* the chambers point diagonally upward. Compare Atkinson's illustrations in the Amer. Jour. Bot. **1**: *pl. 1.*

In normal non-parasitized plants of *Coprinus atramentarius,* the elongation of the stem and the simultaneous epinastic growth in the pileus results in a reversed position of the gill chambers so that when the pileus is formed and ready to expand the chambers lie in a vertical position with their bases outward and their edges towards the stem as in *f. D.* In plants which are parasitized, the elongation of the stem is inhibited and the enlarged gill chambers still lie obliquely upward with their mouths outward in the position which they have in the fully expanded carpophore of a mushroom of which the pileus becomes obconic or infundibuliform. Thus is formed the top-shaped mass of the host plant shown in the illustrations.

The substance of the veil which is left near the base of the stem in normal plants, *pl. 179, f. C,* becomes greatly thickened and

enlarged and covers the mouths of the gill chambers up to the margin of the pileus with a thick coat, *pl. 179, f. B,* and *pl. 178, f. C.* The base of the stem is also much thickened and does not become hollow. In many cases, there is a solid mass of parasitized stem, veil, and gill tissue and no annular gill cavity is formed, but often a more or less evident slit appears between the gills and veil as in *pl. 179, f. A.* This is the cleft observed by Lanzi and interpreted by him as connected with the formation of a ring.

The gills of the host plants attain nearly normal size and sometimes produce spores but are more or less parasitized. The substance of the pileus appears to be least affected and is not greatly thickened in the plants observed. The mycelium of the parasite causes the greatest deformation in the stem and the fruiting bodies are produced from the apex of the stem. This would suggest that the mycelium enters the host from beneath, but the method by which the *Coprinus* becomes infected is unknown.

I can offer no suggestion as to the group to which *Pilosace algeriensis* belongs nor to what non-parasitic mushroom it is nearest akin.

GENESEO, ILLINOIS.

EXPLANATION OF PLATES CLXXVII–CLXXIX

PLATE CLXXVII

Fig. A. Two mature plants of *Volvaria Loweiana* growing from the deformed pileus of *Clitocybe nebularis.*

Fig. B. A single carpophore of the parasite showing the volva.

Fig. C. Two plants of *Volvaria plumulosa* taken from dried specimens.

Fig. D. Form of *Clitocybe nebularis* with nearly equal stem and dark-fuscous pileus.

PLATE CLXXVIII

Fig. A. Large plant of the form of *Clitocybe nebularis* with thick bulbous stem, white pileus, and decurrent gills.

Fig. B. Small plant with adnate or sinuate gills.

Fig. C. Deformed *Coprinus* with a single carpophore of *Pilosace algeriensis* growing from the center of the pileus.

Fig. D. Section of the host showing the depressed pileus with the parasite in the center, the enlarged base of the stem, and the thickened veil covering the edges of the gills.

PLATE CLXXIX

Fig. A. Vertical section of both the host and the parasite. The gill slit has been pulled open slightly. Compare with *Pl. 178, f. D.*

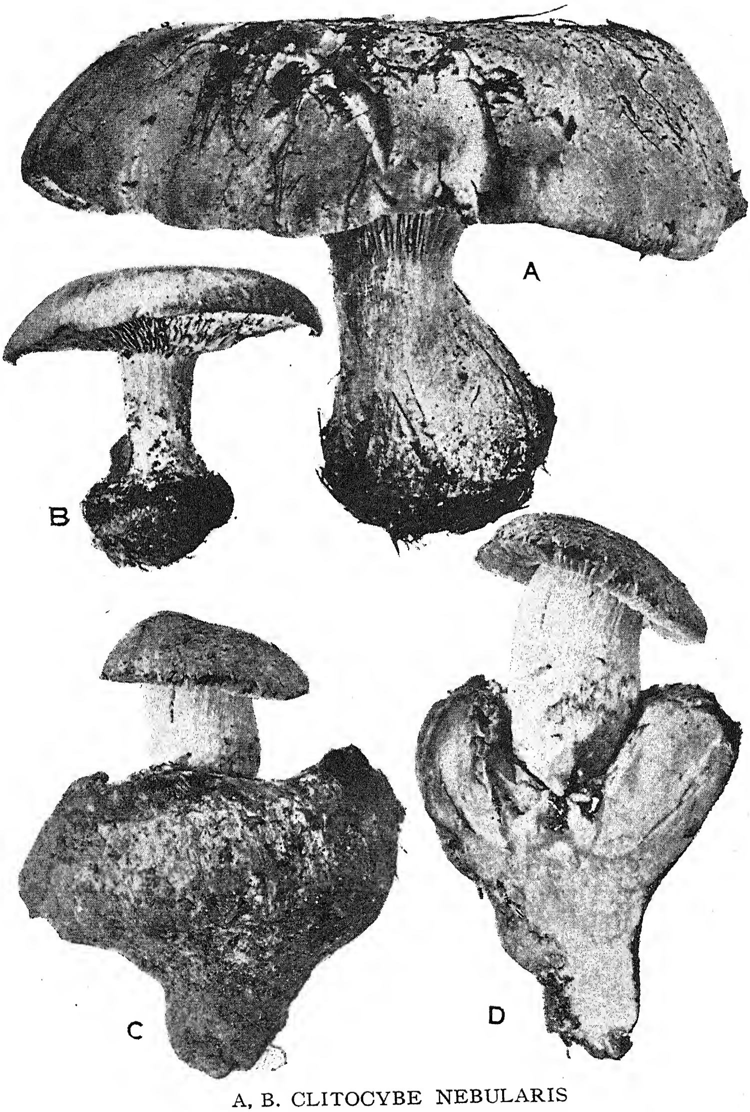
Fig. B. Outer surface of an infected host showing the junction of the pileus and the thickened veil.

Fig. C. Young carpophore of *Coprinus atramentarius* unaffected by the parasite.

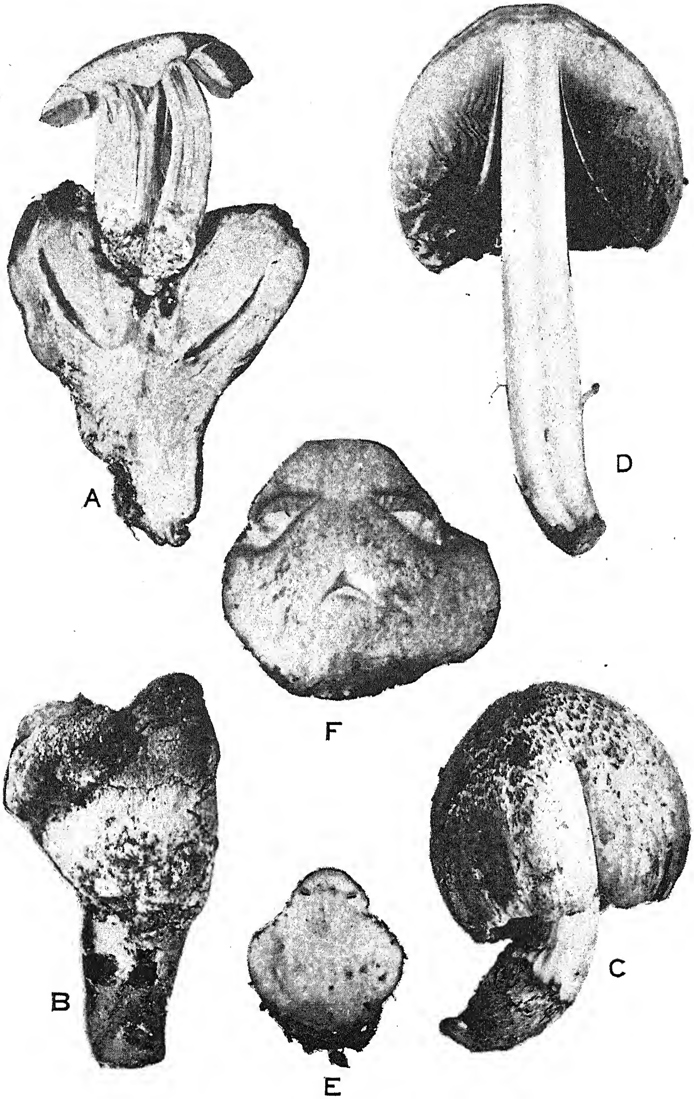
Fig. D. Vertical section showing the position of the gills when the pileus begins to expand.

Fig. E. Section of a young carpophore of *Agaricus arvensis* showing the position of the gill chambers.

Fig. F. Section of a somewhat older carpophore in the growing state, showing the lines of growth, position of the gills and the partial veil when the stem begins to elongate.



A, B. CLITOCYBE NEBULARIS
C, D. PILOSACE ALGERIENSIS



A, B. PILOSACE ALGERIENSIS
C, D. COPRINUS ATRAMENTARIUS
E, F. AGARICUS ARVENSIS

REMARKABLE FOSSIL FUNGI

EDWARD W. BERRY

(WITH PLATES 180–182, CONTAINING 16 FIGURES)

Among the relics of former vegetation that carry the record back many millions of years the remains of fungi are so rarely found that their presence is always exceptional, although it is obvious that many times during the long history of the earth the environment has offered optimum conditions for their abundant development. To mention but one such occasion, that of the formation of the coal measures must have witnessed an exceedingly abundant mycological flora. That these plants were present thus early is indicated by the abundance of hyphae, and other traces of fungal activity such as butyric fermentation, in the tissues of Carboniferous vascular plants, and the scarcity of described forms must be attributed to the perishable nature of most fungal tissues and to the lack of systematic work by experienced mycologists on the more or less obscure material available. To be sure, quite a considerable number of fossil forms referred to Fungi have been recorded from various geologic horizons but the vast majority of these are leaf-spot types based upon real or fancied resemblances, and found on impressions of foliage and without definite botanical characters. Some undoubtedly represent fungal ravages, others are due to insects, some are glandular, and others are purely imaginary.[1]

Sometimes the traces of fungi preserved in petrified plant tissues are fortunately disclosed in sections and a number of well authenticated forms are known, principally from the Carboniferous, their discovery being due almost entirely to the relatively large amount of histological work that has been expended on the Carboniferous flora. Some of the more important of these will be mentioned in the following pages. The exceptional conditions of

[1] For a rather complete illustrated list of all of these forms down to the year 1900 the student is referred to Meschinelli, A., Fungorum Fossilium omnum Iconographia, 1902, 144 pp., 31 pls.

preservation afforded by the accumulations of amber at a time long subsequent to the Carboniferous have given us a glimpse of some few fungal types of the older Tertiary.

In the examination of a large series of petrified woods (the majority of which are of Tertiary age) for the United States Geological Survey, I have frequently noted the ravages of parasitic fungi as well as branching mycelia of both septate and non-septate hyphae. Most of these are too indefinite for incorporation in the record, but it may be safely concluded that fungi were obviously as abundant then as now, and among the remains discovered several are so exceptionally well preserved that their description becomes important to both the botanist and geologist.

The first of these may be called **Peronosporoides palmi** sp. nov., not so much because I am certain that it is related to the modern genus *Peronospora,* but because it resembles various living species in that genus and I believe is clearly referable to the Peronosporaceæ. It may be described as far as the nature of the material permits as follows:

Mycelium intercellular, freely branching, with fused cross branches. Hyphae thin, .0025 mm. to .00375 mm. in diameter, profusely septate, the lengths of the cells variable, no clamp connections observed. Oögonia intercellular, numerous, relatively large, spherical, terminal, about .0357 mm. in diameter. Antheridia somewhat smaller, about .0238 mm. in diameter, subspherical. Objects having all the appearance of oöspores or zoöspores are distinctly visible in some of the oöginia. *Pl. 180, f. 2,* shows two partially collapsed antheridia in conjugation with oögonia and the oögonia which are interpreted as containing oöspores are found in those oögonia as in *Pl. 180, f. 3,* where the antheridium is completely collapsed and only a trace of it is left or where it has entirely disappeared.

This form is exceedingly abundant and beautifully silicified in a small stem (about 7 cm. in diameter) of *Palmoxylon cellulosum* Knowlton from the lower Oligocene of Mississippi. Oögonia and antheridia are plentiful both in the broken down fibro-vascular bundles and in the intercellular spaces of the parenchymatous ground mass of the stem. Several of the oögonia show what are clearly to be interpreted as spores and after making a careful survey of the literature I feel justified in asserting that this is the

best preserved fungus thus far discovered. It is true that this Oligocene species is very similar to the type figures of *Peronosporites antiquaria* Worthington Smith[2] but his figures are evidently idealized from his knowledge of recent fungi, if reliance can be placed on Seward's statement[3] that "Prof. Williamson and others have carefully examined the specimens, but they have failed to detect any trace of reproductive cells enclosed in the spherical sacs." Whether this does or does not do an injustice to the original describer of *Peronosporites antiquarius* I am unable to state, but feel disposed to give full weight to Seward's statement since this form has been found to be quite abundant in the scalariform tissues of *Lepidodendron* and both Cash and Hick[4] and Williamson[5] have described similar material. The latter author states that an examination of Smith's type as well as additional slides failed to show any oöspores or any septation of the hyphae and he states that its botanical relations are with the Saprolegnieae and not with the Peronosporaceae.

A form very similar to the English species has been described from the French coal measures as *Palaeomyces* by Renault,[6] and Coulter and Land[7] have recently figured what appear to be an-

[7] Coulter and Land, Bot. Gaz. vol. 51, 1911, p. 452, figs. 21–23.

theridia and oögonia which they found in rootlets that had penetrated a *Lepidostrobus* cone from the Carboniferous of Warren County, Iowa. Jeffrey[8] has described and figured a fungus found in the Tertiary lignites of Brandon, Vermont, which he calls *Sclerotites brandonianus* and which while he interprets it as a sclerotium stage, is not unlike *Peronosporoides palmi*, although it occurs in dicotyledonous instead of monocotyledonous wood and is not nearly as well preserved as the latter species.

To avoid any possible errors of representation, I have therefore

[2] Gardeners Chronicle, vol. 8, 1877, p. 499.

[3] Fossil Plants, 1898, p. 218.

[4] Cash and Hick, On fossil fungi from the Lower Coal-Measures of Halifax. Proc. Yorkshire Geol. Polyt. Soc., vol. 7, 1878, p. 115.

[5] Williamson, W. C. Philos. Trans. Roy. Soc., vol. 172, 1881, p. 300, pl. 48, figs. 36–38; pl. 54, figs. 28–33.

[6] Bassin houiller et permien d'Autun et d'Epinac, Fasc. IV, 2e partie, 1896, pp. 439, 441, figs. 88, 89, 90.

[8] Jeffrey, E. C., Geol. Surv. Vermont, Rept. from 1905–1906, p. 200.

illustrated this species photographically, although drawings would bring out the details to better advantage. I have submitted specimens to the mycologists of the Bureau of Plant Industry and wish to record my indebtedness to Mrs. Flora W. Patterson, the Mycologist in Charge of the Pathological Collections, for information and suggestions. She has confirmed the presence of oöspores in some of the oögonia and was disposed to consider the form identical with *Peronosporites antiquarius*. In review of the statements of Murray (in the Academy, Nov. 17, 1877), and of Williamson and Seward mentioned above, it is obvious that we are dealing with a distinct form. Due weight must also be given to the enormous time interval between the Carboniferous and Oligocene, as well as the geographic interval between Yorkshire and Mississippi. Moreover the oögonia of the American species are more than twice the size of the supposed oögonia of *Peronosporites antiquarius.*

Regarding the botanical position of the present form it is clearly a Phycomycete and belongs to the group Oömycetes. In the latter group I cannot find any family of existing forms to which it can be referred other than the Peronosporaceae. It is, of course, necessary to consider whether the existing families extend back in time some million of years, and on this point I am inclined to think the endoparasitic forms have varied but little since they assumed their present mode of life in their substantially unchanged environment. The Peronosporaceae are commonly thought of as exclusively endoparasitic in leaves and as exserting their spore-producing apparatus into the air through stomata or dissolved cuticles, thus producing the familiar downy mildews. A number of forms have, however, been observed in which the older mycelial branches in rotting tissues swell up and form antheridia and oögonia within these tissues and it is a reasonable assumption that Peronospora-like extinct genera, which perhaps if they could be studied with the facility of existing forms would be referred to extinct families, have existed in past time. I have therefore proposed the generic term *Peronosporoides* for forms like the present which resemble the modern Peronosporaceae and are undoubtedly filiated types.

[9] Felix, J. Zeitz. deutsch. geol. Gesell., 1894, p. 276, pl. 19, fig. 1.

The second form appears to be referable to the genus *Cladosporites* proposed by Felix[9] in 1894 for an Eocene form from Perekeschkul, Austria. It may be called **Cladosporites oligocaenicum** sp. nov. in allusion to its occurrence in wood of lower Oligocene age. It is found in the same rotten stem of *Palmoxylon cellulosum* Knowlton as *Peronosporoides palmi.* It shows a much-branched intra-cellular mycelium with united side branches and made up of fine, much-septate hyphae .0028 mm. in diameter. These hyphae proliferate freely within the cells of the parenchyma and occasionally are observed to send off haustoria to the walls. They frequently show terminal conidia which are in linear pairs, triplets or quadruplets, being generally in pairs or triplets. The conidia are sub-spherical in form and range in diameter from .0035 mm. to .0054 mm. For example, in *Pl. 181, f. 4,* the proximal segment is .00357 mm. × .004 mm.; the middle segment is .0045 mm. × .0054 mm.; and the distal segment is .0036 mm. × .004 mm. Associated with these well marked conidia and borne on hyphae of similar size are the objects shown on *Plate 181, fig. 2, 5, and 8,* which it would seem can best be interpreted as zygosporangia. They are without preserved contents and are not certainly identified with *Cladosporites oligocaenicum. Cladosporites* was named by Felix from its resemblance to the members of the existing genus *Cladosporium* Link, but since the habit of forming chains of conidia is a widespread one in the Fungi and the fossil forms are all endoparasites in the vascular axis of trees, the present species being an intra-cellular parasite, I am not prepared to say that they should be referred to the Didymosporae of the Hyphomycetes (Lindau) or just what their nearest existing relatives should be considered to be. An additional species of *Cladosporites* was recently described by Whitford[10] from the Pliocene Snake Creek beds of Nebraska.

The third new species to which I wish to call attention may be named **Cladosporites fasciculatus** sp. nov. It is found in exceeding abundance in silicified specimens of lauraceous wood from the middle Eocene (Yegua formation of the Claiborne group) of

[10] Whitford, A. C., University Studies, Univ. of Nebraska, vol. 14, 1914, 3 pp., 2 pls.

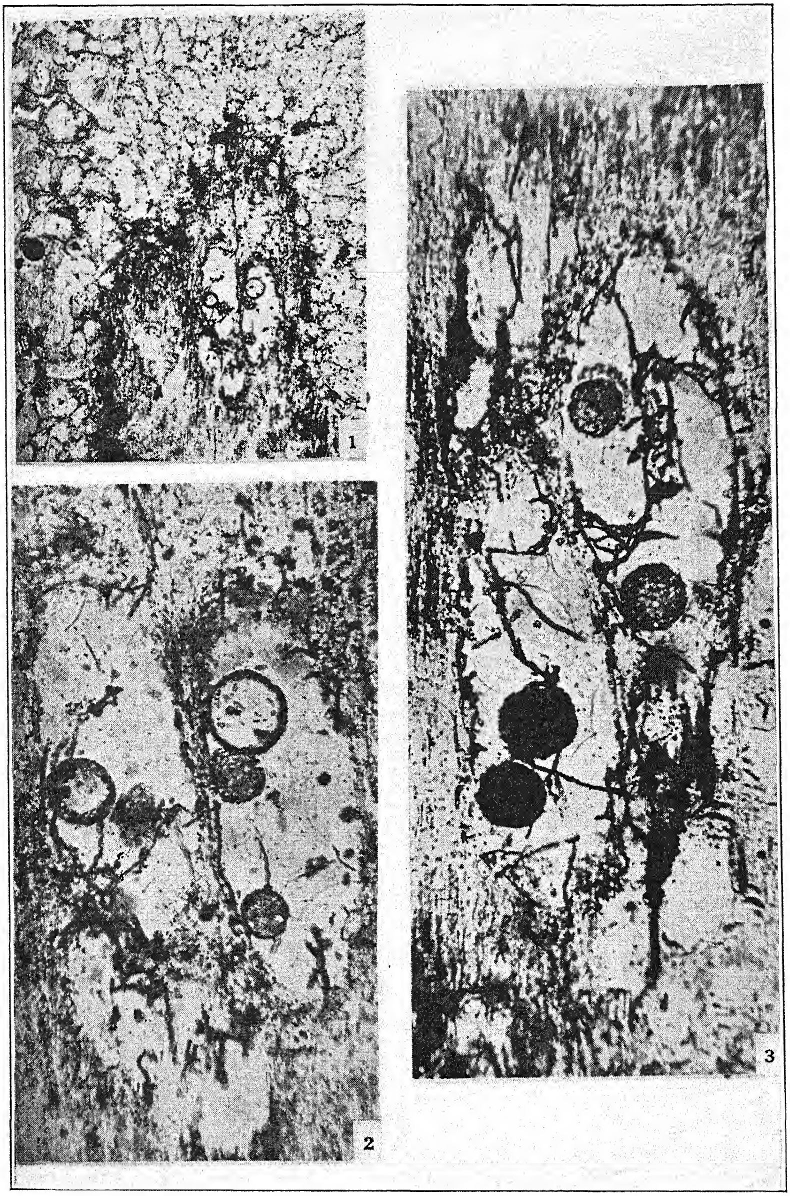
Texas and is entirely unlike any previously recorded fossil forms. I do not know its botanical affinity and rather than multiply generic terms of unknown botanical value I have preferred to refer this and the preceding species to Felix's genus *Cladosporites,* being influenced in the case of the present species by its resemblance to the existing *Cladosporium herbarum* (Pers.) Link. It may be incompletely described as follows: Mycelium intra-cellular, in the vessels of the secondary wood, attached to the vessel walls by haustoria, and forming small fasciculate apparently unbranched tufts projecting freely in the vessel cavity. The hyphae are thin and the majority are somewhat tapering distad although in some cases they taper proximad. Septa were not observed. In only one case was a distal branch observed (*Pl. 182, f. 1.*) Although there are some hundreds of tufts of this fungus in the slides examined, only two of these show conidia (*Pl. 182, f. 2*). The latter are terminal, fusiform in outline and somewhat variable in length. They appear to be simple and I am unable to assert positively that they are cut off from the hyphae by septa although I imagined that I saw such septation. The hyphae average about .0013 mm. in diameter and the conidia range from .002 mm. × .004 mm. to .002 mm. × .012 mm. in diameter.

Associated with this species are rambling mycelial hyphae which clamber over the vessel walls. These bear numerous antheridia and oögonia or sclerotia and their characteristic appearance is shown in *Pl. 182, f. 2.* I do not consider it worth while to attempt to name or describe them.

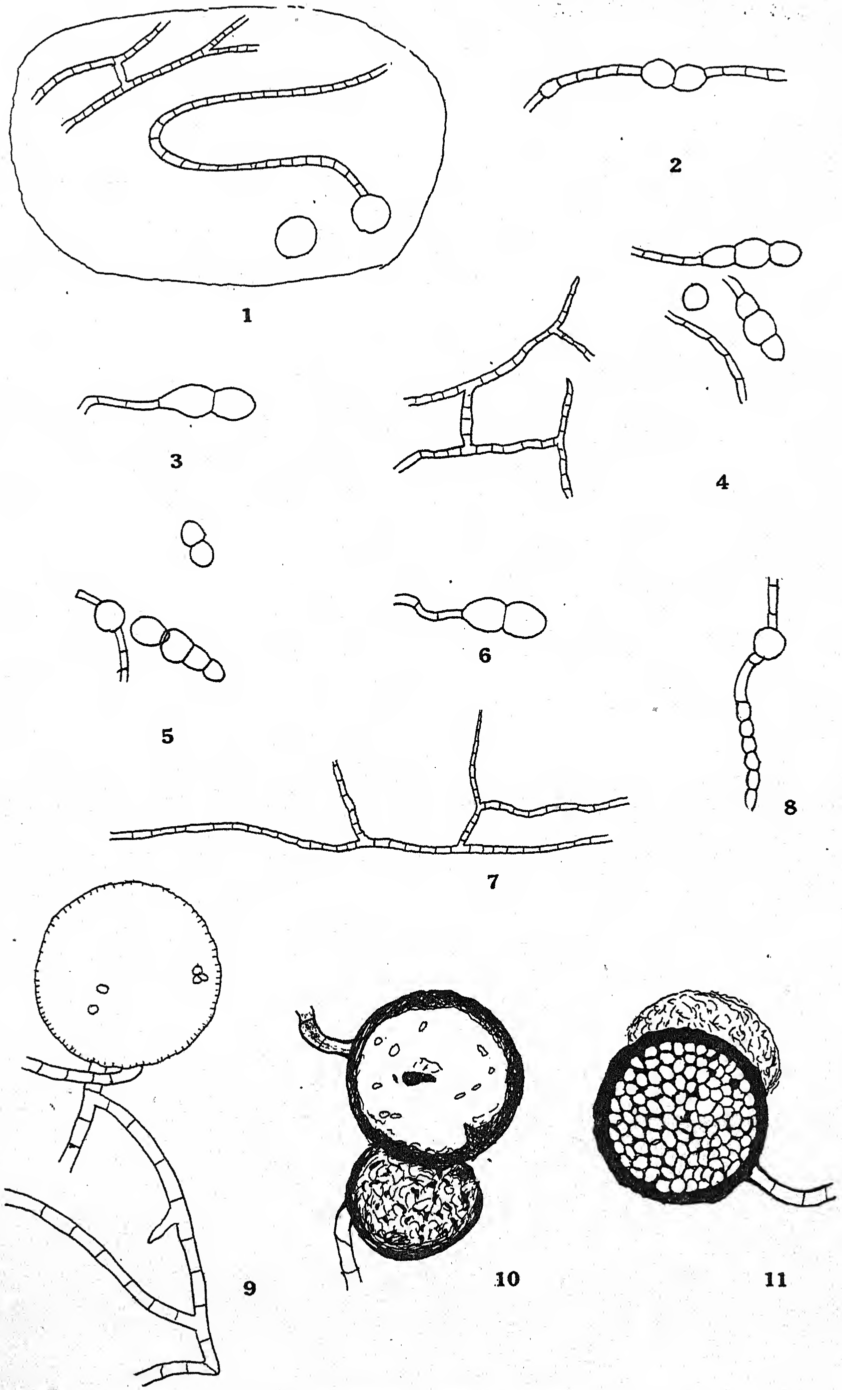
The three species that I have ventured to describe are so unique and well preserved as well as so characteristic that I hope their publication may incite some experienced mycologist to delve in the field of fossil fungi which should prove to be a scientifically fruitful as well as delightful occupation.

It has been abundantly proven that we knew but little of the phylogeny of the vascular plants before their extinct ancestors were considered and the same should prove true in the case of the lower plants which are of so much more ancient a lineage.

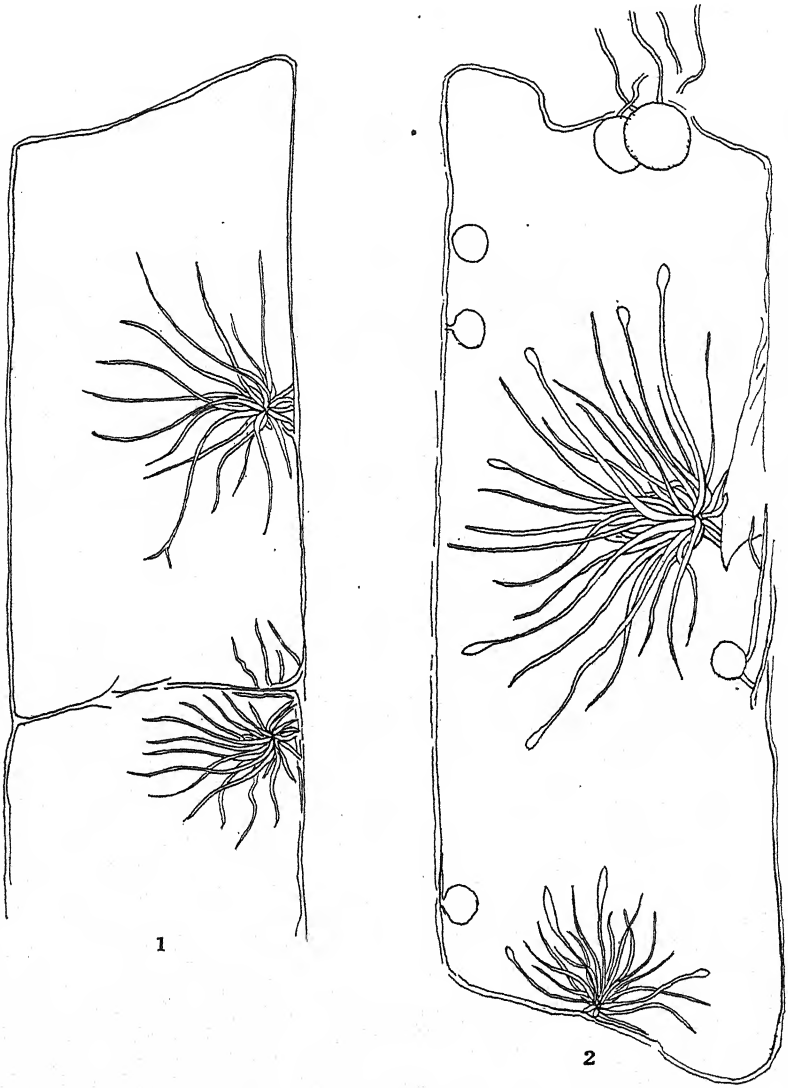
THE JOHNS HOPKINS UNIVERSITY,
BALTIMORE, MARYLAND.



PERONOSPOROIDES PALMI BERRY



1–8. CLADOSPORITES OLIGOCAENICUM BERRY
9–11. PERONOSPOROIDES PALMI BERRY



1 2

CLADOSPORITES FASCICULATUS BERRY

Explanation of Plates CLXXX–CLXXXII

Plate CLXXX

Figs. 1–3. *Peronosporoides palmi* Berry. Showing mycelia, antheridia, and oögonia in tissues of *Palmoxylon cellulosum* Knowlton from the lower Oligocene of Bayou Pierre, Mississippi. Fig. 1, × 50; figs. 2 and 3, × 200.

Plate CLXXXI

Figs. 1–8. *Cladosporites oligocaenicum* Berry. Showing mycelia, zygosporangia, and conidia in the tissues of *Palmoxylon cellullosum* Knowlton from the lower Oligocene of Bayou Pierre, Mississippi. × 400.

Figs. 9–11. *Peronosporoides palmi* Berry.

Fig. 9. Mycelium with oögonium. × 400.

Fig. 10. Antheridium and oögonium. × 400.

Fig. 11. Oögonium with oöspores and traces of collapsed antheridium. × 400.

Plate CLXXXII

Figs. 1, 2. *Cladosporites fasciculatus* Berry. Showing mycelia and conidia in vessels of *Laurinoxylon* from Middle Eocene of Westmorland Bluff, Trinity River, Texas. × 400

LABORATORY TESTS ON THE DURABILITY OF AMERICAN WOODS—I.

FLASK TESTS ON CONIFERS

C. J. Humphrey

(With Plate 183)

Introduction

Our present knowledge of the relative durability of American woods has been, for the most part, derived from service or field tests carried out by engineers or agriculturalists. Certain of the larger wood users, such as railroads, telephone and telegraph companies, have for several years past kept records on the durability of ties, poles and other timbers as a basis for the selection of durable material or for determining the expediency of applying wood preservatives. Similar data have been secured through the experimental work of the United States Forest Service and the Agricultural Experiment Stations.

The conditions governing such tests can not be kept uniform or in any way put under control. Hence, even for a single species of timber, the data secured will be highly variable, depending upon the character of the soil, drainage, air and soil temperature, precipitation, atmospheric humidity, and any other factors which may influence the growth of wood-rotting fungi. Since environmental factors offer great variations between different regions of the United States, we can readily see why the natural durability of timber in warm, humid regions, for instance, frequently falls short of its resistance to decay in cooler, less moist localities.

The question of the presence or absence of certain of the more destructive species of fungi in a given locality also influences natural durability. In regions long free of forests the soil may, for instance, be comparatively free of wood-rotting fungi. The relative great abundance of decay-producing species and individuals in the tropics is one factor in the rapid deterioration of timber in those regions. It is but Nature's way in maintaining the proper

balance in plant life, for where trees develop luxuriantly they must also rot rapidly.

The manner and rate at which different species of fungi act on given kinds of wood is often highly variable, more or less a specific property of the fungus. Under natural conditions certain species seem exclusively or predominantly to attack conifers, while others confine their activities to hardwood (broadleaf) timber. Still others may attack almost exclusively hardwood trees in one region and conifers in another. In some cases this may be an apparent rather than a real condition, however, since our judgment as to the identity of a fungus rests upon the morphological characters of the fruit-bodies which it produces and it is an oft-observed fact that many decaying timbers fail to develop the fruiting stage of the organism at all.

LABORATORY TESTS ON DURABILITY

Comparatively few laboratory tests on the durability of timber are recorded either in European or American literature. The European continent, however, has few timber species compared with the great variety on the American side.

Through the activities of the United States Forest Service strength values and other physical properties of our commercial woods have been worked out, but this paper is the first of a series on the relative resistance which the different timbers offer toward different fungi. It is proposed to carry on the work from year to year, using various wood-rotting fungi and adding new kinds of timber as they are made available.

The work was begun about three years ago at the Forest Products Laboratory on material collected from all portions of the United States primarily for timber test purposes. Both heartwood and sapwood were secured whenever possible, but since the available material comprised in many cases only corners and slabs remaining after sawing out the specimens for strength tests it was not always possible to get everything desired. In the case of hemlocks, firs and spruces heartwood and sapwood are poorly differentiated as far as color changes go, the differences in physiological functions in the living trees, however, are just as marked as in

other species of timber. Wood classed as heartwood was always selected well within the sapwood ring.

The present paper comprises tests on 28 species of conifers and presents data only on single specimens of wood for three different test periods. As it consists in but one set of tests the figures should be considered as preliminary and indicative rather than final. Other tests now under way will throw further light on the question and when sufficient data have accumulated generalizations will become admissable. Due consideration to these facts should be given in interpreting durability values. Also, the fact that different samples of the same kind of wood show different durabilities, depending upon their physical, and possibly chemical, constitution must be kept in mind in establishing a true conception of the resistance which the woods offer to decay.

The very destructive and vigorous-growing fungus, *Lentinus lepideus* Fr., which is abundantly distributed on coniferous timber over practically the entire United States, was selected for this first series of tests on account of its very rapid growth and the vigor with which it is known to rot many species of conifers in nature. The culture was secured from a tissue transfer taken from a plant collected by the writer from a Douglas fir stump in Montana in 1910. The purity of the culture is unquestioned; it has produced typical, but, of course, reduced, fruit-bodies several times during the course of the tests (*Plate 183.*)

METHOD

All tests have been conducted in 2-liter Erlenmeyer flasks, plugged rather tightly with absorbent cotton, and then capped with thin muslin soaked in a dilute solution of mercuric chloride.

The flasks were prepared in triplicate, the original intention being to examine the first at the end of three months, the second after six months, and the third after nine months. Field work interrupted this schedule somewhat, as noted by the tables.

The test woods were identified and the logs marked with a stencil or paint in the forest by the various collectors. They were then shipped to the laboratory in a green condition and sawn as needed. The blocks for durability tests were cut ⅝ by ⅝ inch

square and 2 inches long from clear material, free of defects. In selecting heart and sapwood close attention was paid to getting representative material. In order to determine the actual loss in weight from decay, the blocks were dried in a steam-heated oven for 48 hours at a temperature of 100° C., or close around that point, and then weighed to the nearest .01 of a gram. On the completion of the tests the blocks were again oven-dried in a similar manner, the resulting weights compared with the original, and the percentage loss, based on the dry weight of the sound material calculated.

The flasks in which the experiments were carried out were prepared as follows: Culture blocks[1] from 1 to 2 inches long and of a diameter sufficient to go through the neck of a wide-mouth flask were cut from hemlock, boiled to saturation in tap water, and given a preliminary sterilization of several hours at about 10 pounds pressure in the autoclave. This was for the purpose of killing any latent fungi and of removing the excess water. On removing from the autoclave a layer of these blocks was placed in the bottom of each flask, resting on a layer of absorbent cotton[2] saturated with water. The test blocks, usually ten different species to a flask, were then inserted in a dry condition, taking care to keep them well off the wet cotton. Another layer of hemlock culture blocks was then added to about three-fourths of the height of the flask, this being surmounted by another wad of saturated absorbent cotton. The flasks were then tightly plugged with cotton and sterilized in the autoclave, without pressure, for periods of 45, 30, and 30 minutes, respectively, on three successive days.

After sterilization they were inoculated with a culture of *Lentinus lepideus,* growing on a bean pod, by emptying the bean directly into the flask. When inoculating wood cultures it is quite essential to use a generous quantity of infecting material.

The test blocks were grouped more or less according to their supposed durability, heartwood and sapwood samples in every

[1] The term "culture blocks" refers to the irregular hemlock blocks introduced into the flasks as a medium to support a vigorous growth of the fungus in order to secure a uniform and severe infection of the "test blocks."

[2] In later work the cotton has been omitted, as the test blocks often became too wet.

TABLE I

DURABILITY OF SAPWOOD AFTER 4 MONTHS' TEST[3]

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Flask No.	Oven-Dry Weight (Grams)		Loss		Remarks
		Before Test	After Test	Grams	Per Cent.	
Eastern hemlock	1	6.44	5.25	1.19	18.5	Considerably rotted.
Mountain hemlock	1	7.39	7.07	0.32	4.3*	
Western hemlock	4	7.87	5.67	2.20	28.0	Seriously rotted.
Engelmann spruce	4	6.35	4.51	1.84	29.0	Seriously rotted.
Sitka spruce	4	5.49	4.61	0.88	14.2*	
Red spruce	4	6.79	4.98	1.81	26.7	Rotted at ends.
White spruce	4	6.25	4.51	1.74	27.8	Seriously rotted.
Alpine fir	4	6.19	4.76	1.43	23.1	Seriously rotted.
Grand fir	4	7.30	6.90	0.4	5.5*	
Grand fir	4	5.98	4.58	1.40	23.4	Seriously rotted.
Noble fir	4	6.73	5.05	1.68	25.0	Seriously rotted.
Douglas fir	7	7.36	5.42	1.94	26.4	Seriously rotted.
European larch	4	7.16	6.44	0.72	10.0*	
Western yellow pine	1	6.65	5.03	1.62	24.4	Seriously rotted.
Lodgepole pine	1	6.80	5.37	1.43	21.0	Seriously rotted.
Longleaf pine	7	7.93	5.51	2.42	30.5	Seriously rotted.
Shortleaf pine	7	8.46	6.34	2.12	25.1	Seriously rotted in springwood.
Table mountain pine	1	7.33	6.69	0.64	8.7*	
Pitch pine	1	8.65	6.55	2.10	24.3	Seriously rotted.
White pine	1	4.12	3.06	1.06	25.7	Seriously rotted.
Sugar pine	1	5.11	3.94	1.17	22.9	Seriously rotted.
Western white pine	1	6.40	5.30	1.10	17.2	Considerably rotted.
White cedar	7	4.52	4.50	0.02	.. *	
Western red cedar	7	4.76	4.65	0.11	2.3*	
Port Orford cedar	7	6.52	5.23	1.29	19.8	Seriously rotted on three sides.
California juniper	7	9.50	6.81	2.69	28.3	Seriously rotted.
Western juniper	7	6.77	5.30	1.47	21.7	Seriously rotted.
Bigtree	7	7.94	7.72	0.22	2.8*	

case being tested in separate flasks. Each block was marked by writing its name and number on two faces with a soft heavy-leaded pencil. This system of marking has proven satisfactory and has been adopted for all work of this nature.

The flasks were inoculated on January 29, 1914. In about a month the contents were uniformly infected throughout. Flasks 11, 12, and 17, becoming contaminated with molds, were opened, the test blocks again oven-dried for 24 hours and new culture flasks prepared as before. All cultures were then kept in a glass case in the diffuse light of the laboratory. The temperature fluc-

[3] Data in this table and the following are based on single specimens of each sample of wood.

TABLE II

DURABILITY OF HEARTWOOD AFTER 4 MONTHS' TEST

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Flask No.	Oven-Dry Weight (Grams)		Loss		Remarks
		Before Test	After Test	Grams	Per Cent.	
Eastern hemlock......	16	7.75	6.12	1.63	21.0	Considerably rotted.
Mountain hemlock....	16	8.25	4.90	3.35	40.6	Seriously rotted.
Western hemlock......	13	7.19	5.31	1.88	26.1	Seriously rotted.
Engelmann spruce.....	13	7.10	3.65	3.45	48.6	Friable when dry.
Sitka spruce..........	13	6.81	4.43	2.38	34.9	Seriously rotted.
Red spruce...........	13	6.89	4.80	2.09	30.3	Seriously rotted.
White spruce..........	13	6.20	4.11	2.09	33.7	Seriously rotted.
Alpine fir.............	13	6.22	3.73	2.49	40.0	Friable when dry.
Grand fir.............	13	7.23	5.04	2.19	30.3	Friable when dry.
Grand fir.............	13	5.93	2.79	3.14	53.0	Friable when dry.
Noble fir.............	13	7.44	5.11	2.33	31.3	Seriously rotted.
Douglas fir...........	10	7.12	4.73	2.39	33.6	Seriously rotted.
European larch........	13	7.23	4.18	3.05	42.2	Seriously rotted.
Western yellow pine...	16	7.11	5.84	1.27	17.9	Considerably rotted.
Lodgepole pine........	16	6.74	5.75	0.99	14.7*	Considerably rotted.
Longleaf pine.........	10	10.62	10.58	0.04	0.4	Sound.
Shortleaf pine.........	10	11.51	10.70	0.81	7.0	Slightly rotted in springwood.
Table mountain pine...	16	10.50	10.12	0.38	3.6	Slightly affected.
Pitch pine............	16	10.69	10.44	0.25	2.3*	
Norway pine..........	16	8.02	8.02	0	0 *	
White pine...........	16	6.57	6.50	0.07	1.1*	
Sugar pine............	16	5.95	5.10	0.85	14.3*	
Western white pine....	16	7.14	6.45	0.69	9.7*	Considerably rotted.
White cedar..........	10	5.07	5.10	0	0	Sound.
Western red cedar.....	10	5.06	5.04	0.02	0.4*	
Port Orford cedar.....	10	7.15	7.06	0.09	1.3*	
California juniper.....	10	9.88	9.90	0	0	Sound.
Western juniper.......	10	6.15	6.11	0.04	0.7*	
Bigtree..............	10	8.10	8.04	0.06	0.7	Sound.

tuated considerably with the seasonal variations, usually around 20° C. in the winter and running up to 25 to 30° C. during the warm summer months.

Eighteen flasks in all were prepared. Flasks 1, 4, 7, 10, 13, and 16 were opened and examined on May 24, 1914, four months after inoculation; flasks 2, 5, 8, and 14 were opened on August 4, after six months' test; flasks 3, 6, 9, 15, and 18 after twelve months; flasks 11, 12, and 17, which were remade and inoculated on March 24, 1914, were examined on the same date the following year.

In computing the actual period of test it should be kept in mind that from three to four weeks are required to get a uniform infection after the inoculations are made. In the following tables,

TABLE III

DURABILITY OF SAPWOOD AFTER 6 MONTHS' TEST

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Flask No.	Oven-Dry Weight (Grams)		Loss		Remarks
		Before Test	After Test	Grams	Per Cent.	
Eastern hemlock......	2	6.55	5.46	1.09	16.6*	Rotted at ends.
Mountain hemock.....	2	7.40	6.13	1.27	17.2*	Rotted at ends.
Western hemlock......	5	8.55	7.52	1.03	12.0*	
Engelmann spruce.....	5	6.11	3.41	2.70	44.2	Well rotted.
Sitka spruce..........	5	5.74	2.68	3.06	53.3	Friable when dry.
Red spruce...........	5	6.43	3.39	3.04	47.3	Friable when dry.
White spruce.........	5	6.45	3.21	3.24	50.2	Friable when dry.
Alpine fir.............	5	6.15	3.40	2.75	44.7	Friable when dry
Grand fir.............	5	6.57	3.90	2.67	40.6	Well rotted.
Grand fir.............	5	5.95	3.64	2.31	38.8	Well rotted.
Noble fir.............	5	6.53	3.80	2.73	41.8	Well rotted.
Douglas fir...........	8	7.67	3.96	3.71	48.4	Friable when dry.
European larch.......	5	7.40	3.73	3.67	49.6	Friable when dry.
Western yellow pine...	2	7.27	3.45	3.82	52.5	Well rotted.
Lodgepole pine........	2	7.10	3.79	3.31	46.6	Well rotted.
Longleaf pine.........	8	8.78	3.85	4.93	56.1	Friable when dry.
Shortleaf pine.........	8	7.90	2.79	5.11	64.7	Friable when dry.
Table mountain pine...	2	7.80	4.53	3.27	41.9	Well rotted in springwood.
Pitch pine............	2	8.92	7.60	1.32	14.8*	
White pine...........	2	4.20	2.00	2.20	52.4	Friable when dry.
Sugar pine...........	2	5.11	2.31	2.80	54.8	Friable when dry.
Western white pine....	2	8.10	4.45	3.65	45.1	Well rotted.
White cedar..........	8	4.56	4.07	0.49	10.7	Well rotted on sap side—two-fifths heartwood.
Western red cedar.....	8	4.86	1.96	2.90	59.7	Friable when dry.
Port Orford cedar.....	8	6.20	3.85	2.35	37.9	Well rotted at ends.
California juniper.....	8	9.59	8.44	1.15	12.0*	
Western juniper.......	8	6.65	3.40	3.25	48.9	Friable when dry.
Bigtree..............	8	8.39	5.24	3.15	37.5	Well rotted in springwood.

however, the test period is considered as beginning with the date of inoculation.

Tables I to VI present the essential data, giving the loss in weight after the different test intervals, together with notes on the condition of the test blocks.

In Table VII the preceding tables are summarized, averages being given for both the heartwood and sapwood of hemlocks, spruces and firs and for the sapwood of the white and hard pine groups. Where the test blocks were too wet they have been marked by an asterisk and have been excluded from all averages.

TABLE IV

DURABILITY OF HEARTWOOD AFTER 6 MONTHS' TEST

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Flask No.	Oven-Dry Weight (Grams)		Loss		Remarks
		Before Test	After Test	Grams	Per Cent.	
Western hemlock......	14	7.14	3.30	3.84	53.8	Friable when dry.
Engelmann spruce.....	14	7.25	3.55	3.70	51.0	Friable when dry.
Sitka spruce..........	14	6.29	3.60	2.69	42.8	Friable when dry.
Red spruce...........	14	6.84	2.90	3.94	57.6	Friable when dry.
White spruce..........	14	6.13	3.20	2.93	47.9	Friable when dry.
Alpine fir.............	14	6.75	3.55	3.20	47.4	Friable when dry.
Grand fir.............	14	7.04	3.85	3.19	45.3	Friable when dry.
Grand fir.............	14	5.65	2.86	2.79	49.4	Friable when dry.
Noble.................	14	7.87	4.85	3.02	38.4	Friable when dry.
European larch.......	14	10.04	7.48	2.56	25.5	Well rotted in springwood.

In drawing conclusions from the above data the moisture condition of the test blocks should be given due weight. Such as became obviously too wet for decay to progress at its maximum rate have been indicated, but certain of the other blocks may have varied around their optimum sufficiently to influence the results somewhat. There is a strong indication that certain of the woods vary in their hygroscopic properties, and would thus absorb more moisture in a given time than other woods placed under similar conditions in the same flasks.

In order to assist toward a proper conception of the prevailing moisture condition the records made at the time of opening the flasks are presented as follows:

Flasks 11, 12, 16, and 17 were undeniably too wet. The results on flask 17 have not been used and flasks 11 and 12 have only been employed insofar as they appear of some value in forming a tentative estimate of durability.

In flasks 1, 2, 4, 7, 8, 9, 10, and 18 the moisture conditions were fairly good but rather in excess of the optimum.

Flasks 3, 5, 6, 13, 14, and 15 were in excellent condition, flask 13 apparently being the best of all.

In flask 10 the blocks of white cedar and California juniper were lying close to the top and were only slightly overgrown.

The growth of the fungus was very luxuriant in all and the

TABLE V

DURABILITY OF SAPWOOD AFTER 12 MONTHS' TEST

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Flask No.	Oven-Dry Weight (Grams)		Loss		Remarks
		Before Test	After Test	Grams	Per Cent.	
Eastern hemlock	3	7.40	2.39	5.01	67.7	Friable when dry.
Mountain hemlock	3	8.08	2.47	5.61	69.4	Friable when dry.
Western hemlock	6	7.95	2.41	5.54	69.7	Friable when dry.
Engelmann spruce	6	6.91	2.20	4.71	68.2	Friable when dry.
Sitka spruce	6	5.84	1.84	4.00	68.5	Friable when dry.
Red spruce	6	6.21	2.00	4.21	67.8	Friable when dry.
White spruce	6	7.26	1.78	5.48	75.5	Friable when dry.
Alpine fir	6	5.95	2.05	3.90	65.5	Friable when dry.
Grand fir	6	6.58	2.52	4.06	61.7	Friable when dry.
Grand fir	6	6.37	1.93	4.44	69.7	Friable when dry.
Noble fir	6	6.52	2.04	4.48	68.7	Friable when dry.
Douglas fir	9	7.52	2.37	5.15	68.5	Friable when dry.
European larch	6	7.16	2.11	5.05	70.5	Friable when dry.
Western yellow pine	3	8.18	2.38	5.80	70.9	Friable when dry.
Lodgepole pine	3	7.13	2.30	4.83	67.7	Friable when dry.
Longleaf pine	9	8.13	2.49	5.64	69.4	Friable when dry.
Shortleaf pine	9	9.57	3.00	6.57	68.7	Friable when dry.
Table mountain pine	3	8.00	2.40	5.60	70.0	Friable when dry.
Pitch pine	3	9.60	2.75	6.85	71.4	Friable when dry.
White pine	3	4.75	1.47	3.28	69.1	Friable when dry.
Sugar pine	3	5.18	1.67	3.51	67.8	Friable when dry.
Western white pine	3	8.18	3.15	5.03	61.5	Friable when dry.
White cedar	9	6.63	6.12	0.51	7.7*	Slightly rotted—two-fifths heart.
Western red cedar	9	4.76	3.05	1.71	35.9*	Seriously rotted at ends.
Port Orford cedar	9	6.93	2.30	4.63	66.8	Friable when dry.
California juniper	9	9.30	5.78	3.52	37.9*	Well rotted at ends.
Western juniper	9	7.21	6.00	1.21	16.8*	Considerably rotted.
Bigtree	9	8.38	3.10	5.28	63.0	Friable when dry.

hemlock culture blocks were for the most part thoroughly rotted except as they were too wet, particularly in the bottom of the flasks in contact with the wet cotton.

For the sapwood of 19 species which were in good condition for decay we find an average loss of 24.4 per cent. in 4 months. The average for hemlocks, spruces, and firs (including Douglas fir) was 24.9 per cent. It is thus seen that very little difference exists in the durability of the sapwood of the species tested. An average for the corresponding heartwoods is of no value, on account of the wide differences shown, except for hemlocks, spruces and firs, which average 34.8 per cent. loss. The apparent difference in resistance of heartwood and sapwood in these latter genera, is

TABLE VI

DURABILITY OF HEARTWOOD AFTER 12 MONTHS' TEST

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Flask No.	Oven-Dry Weight (Grams)		Loss		Remarks
		Before Test	After Test	Grams	Per Cent.	
Eastern hemlock	18	7.85	3.17	4.68	59.6	Friable when dry.
Mountain hemlock	18	8.61	3.08	5.53	64.2	Friable when dry.
Western hemlock	15	7.94	3.08	4.86	61.2	Friable when dry.
Engelmann spruce	15	7.23	2.27	4.96	68.6	Friable when dry.
Sitka spruce	15	4.33	1.63	2.70	62.4	Friable when dry.
Red spruce	15	7.07	2.30	4.77	67.5	Friable when dry.
White spruce	15	5.62	1.70	3.92	69.8	Friable when dry.
Grand fir	15	7.10	2.12	4.98	70.1	Friable when dry.
Noble fir	15	7.53	2.25	5.28	70.1	Friable when dry.
Douglas fir	11	7.43	5.34	2.09	28.1*	Seriously rotted at ends.
European larch	15	7.88	4.50	3.38	42.9	Well rotted.
Western yellow pine	18	7.60	3.35	4.25	55.9	Friable when dry.
Lodgepole pine	18	6.93	2.47	4.46	64.4	Friable when dry.
Longleaf pine	12	11.42	5.59	5.83	51.1	Friable when dry.
Shortleaf pine	11	12.25	9.72	2.53	20.7	Seriously rotted in summer wood.
Table mountain pine	18	10.22	6.17	4.05	39.6	Friable when dry.
Pitch pine	18	10.02	8.93	1.09	10.9*	Considerably rotted.
Norway pine	18	8.00	2.45	5.55	69.4	Friable when dry.
White pine	18	6.71	6.12	0.59	8.8	Slightly rotted.
Sugar pine	18	6.06	2.55	3.51	57.9	Friable when dry.
Western white pine	18	7.14	4.85	2.29	32.1*	Well rotted at ends.
White cedar	12	5.40	5.11	0.29	5.4*	Slightly rotted at ends.
Western red cedar	11	5.16	4.06	1.10	21.3*	Seriously rotted at ends.
Port Orford cedar	11	7.81	6.05	1.76	22.6*	Seriously rotted at ends.
California juniper	12	10.66	10.31	0.35	3.3	Slightly affected.
Western juniper	11	5.58	4.73	0.85	15.2*	Seriously rotted ta one end.
Bigtree	11	7.07	4.59	2.48	35.1	Seriously rotted.

considered as having no special significance beyond the fact that little discrimination can be made between them or between the different species represented.

For the six months' period the average loss in the sapwood of 21 species (exclusive of white cedar) was 48 per cent., while the average loss in the heartwood of hemlocks, spruces and firs was 49.6 per cent. These figures show that decay progressed at the same rate during the second three months as during the first three (allowing one month after inoculation for the fungus to become uniformly distributed throughout the flasks).

Sapwood tests over a 12 months' interval resulted in complete decay for all species (23) which were not too wet. The average loss for all was 68.2 per cent. and for hemlocks, spruces and firs

TABLE VII

PER CENT. LOSS IN DRY WEIGHT FOR THE DIFFERENT TEST PERIODS

[An asterisk (*) denotes that the blocks became too wet for a fair test.]

Kind of Wood	Sapwood			Heartwood		
	4 Months	6 Months	12 Months	4 Months	6 Months	12 Months
Hemlocks	23.3	—	68.9	29.2	53.8	61.7
Spruces	27.5	48.7	69.7	36.2	49.8	67.1
Firs	23.8	41.5	66.4	38.9	45.1	70.1
White pines	21.9	50.8	66.1	—	—	—
Hard pines	25.1	52.4	69.7	—	—	—
Western yellow pine	24.4	52.5	70.9	17.9	—	55.9
Lodgepole pine	21.0	46.6	67.7	14.7*	—	64.4
Longleaf pine	30.5	56.1	69.4	0.4	—	51.1
Pitch pine	24.3	14.8*	71.4	2.3*	—	10.9*
Norway pine	—	—	—	0 *	—	69.4
Shortleaf pine	25.1	64.7	68.7	7.0	—	20.7
Western white pine	17.2	45.1	61.5	9.7*	—	32.1*
Sugar pine	22.9	54.8	67.8	14.3*	—	57.9
Table mountain pine	8.7*	41.9	70.0	3.6	—	39.6
White pine	25.7	52.4	69.1	1.1*	—	8.8
European larch	10.0*	49.6	70.5	42.2	25.5	42.9
Douglas fir	26.4	48.4	68.5	33.6	—	28.1*
Bigtree	2.8*	37.5	63.0	0.7	—	35.1
Port Orford cedar	19.8	37.9	66.8	1.3*	—	22.6*
White cedar	0 *	10.7	7.7*	0	—	5.4*
Western red cedar	2.3*	59.7	35.9*	0.4*	—	21.3*
California juniper	28.3	12.0*	37.9*	0	—	3.3
Western juniper	21.7	48.9	16.8*	0.7*	—	15.2*

68.4 per cent. The corresponding loss in the heartwood of the latter genera (exclusive of Douglas fir) was 65.9 per cent. In all of these specimens the wood was so thoroughly rotted that it could be pulverized between the fingers.

The 12 months' test on heartwood of the remaining species brings out considerable differences in durability, ranging from 3.3 per cent. loss in California juniper to 69.4 per cent. in Norway pine. White pine was affected but little (8.8 per cent.), while sugar pine was seriously rotted (57.9 per cent.). Lodgepole pine (64.4 per cent.) fell in the class with hemlocks, spruces and firs. The specimen of longleaf pine, which did not appear very highly resinous, did not prove as resistant (51.1 per cent.) as shortleaf pine (20.7 per cent.), which was of a good grade. Table mountain

pine, a close relative of the shortleaf, and apparently quite resinous, lost 39.6 per cent. The durability of bigtree wood (35.1 per cent.) did not fully meet expectations. Other interesting features of the tests were as follows:

The sapwood of white cedar proved highly durable, standing out in marked contrast to that of any other species tested.

The sapwood of Port Orford cedar, bigtree, western red cedar, junipers, and hard pines was very susceptible to decay.

The sapwood of Douglas fir fell in the same class as the true spruces, firs, and hemlocks.

The heavy, hard, yellowish heartwood of California juniper was considerably more durable than the softer, reddish heartwood of western juniper.

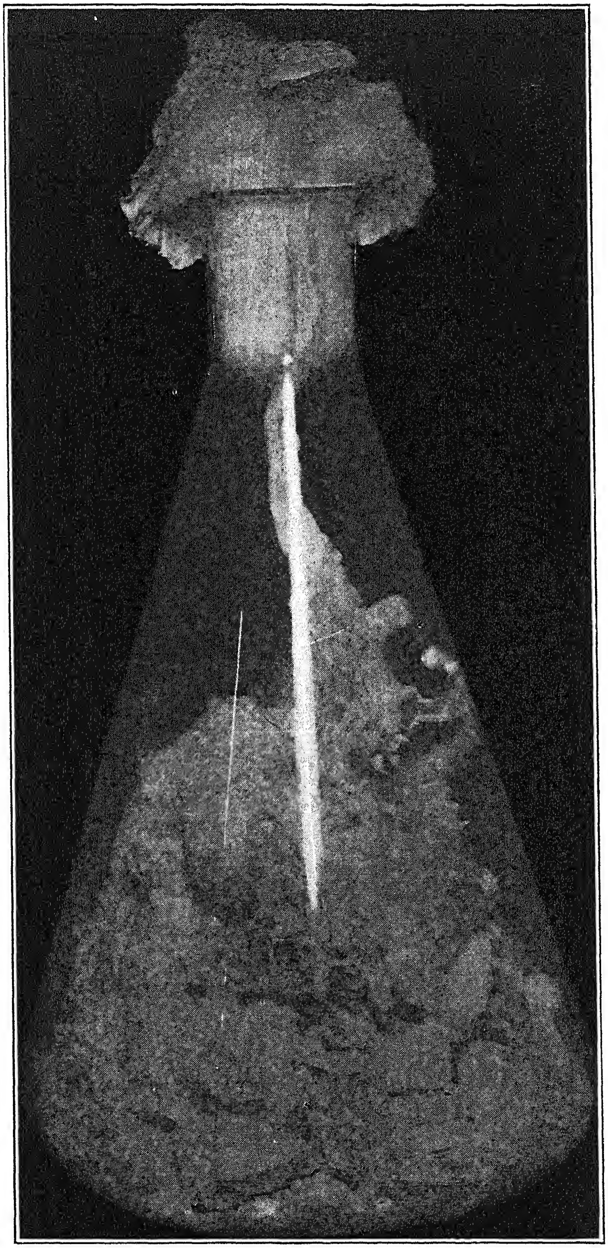
Further tests on the heartwood of such species as Port Orford cedar, white cedar, western red cedar, western juniper, Douglas fir, pitch pine, and western white pine are necessary before safe comparisons can be made.

The common names for woods listed above are, for the most part, those recommended by G. B. Sudworth of the United States Forest Service. The corresponding botanical names, source and laboratory number are as follows:

White cedar, *Thuja occidentalis* L.	Wis.	124
Western red cedar, *Thuja plicata* Don.	Mont.	224–8
Bigtree, *Sequoia washingtoniana* (Winsl.) Sudw.	Cal.	40
Alpine fir, *Abies lasiocarpa* (Hook.) Nutt.	Colo.	15–1
Grand " *Abies grandis* Lindl.	Mont.	224–16 10–9–30
Noble " *Abies nobilis* Lindl.	Wash.	77
Eastern hemlock, *Tsuga canadensis* (L.) Carr.	Tenn.	226–9
Western " *Tsuga heterophylla* (Raf.) Sarg.	Mont.	136
Mountain " *Tsuga mertensiana* (Bong.) Carr.	Wash.	13–4
California juniper, *Juniperus californica* Carr.	Cal.	142
Western " *Juniperus occidentalis* Hook.	Cal.	121
European larch, *Larix europaea* D. C.	Wis.	126
Western yellow pine, *Pinus ponderosa* Laws.	Mont.	224–21
Lodgepole " *Pinus contorta* Loud.	Mont.	10–2
Longleaf " *Pinus palustris* Mill.	La.	176–38
Pitch " *Pinus rigida* Mill.	Tenn.	136
Norway " *Pinus resinosa* Ait.	Wis.	127
Shortleaf " *Pinus echinata* Mill.	Ark.	203–1
Western white " *Pinus monticola* Dougl.	Mont.	224–2
Sugar " *Pinus lambertiana* Dougl.	Cal.	122

Table mountain pine,	*Pinus pungens* Michx. f.	Tenn.	226–80
White "	*Pinus strobus* L.	Wis.	120
Port Orford cedar,	*Chamaecyparis lawsoniana* (Murr.) Parl.	Oreg.	98
Douglas fir,	*Pseudotsuga taxifolia* (Lam.) Britt.	Cal.	38–6–2
Engelmann spruce,	*Picea engelmanni* Engelm.	Colo.	15–25
Red "	*Picea rubens* Sarg.	Tenn.	226–84
Sitka "	*Picea sitchensis* (Bong.) Trautv. & Mayer	Wash.	13–7
White "	*Picea canadensis* (Mill.) B. S. P.	N. H.	60

INVESTIGATIONS IN FOREST PATHOLOGY, BUREAU OF PLANT INDUSTRY, IN COOPERATION WITH THE FOREST PRODUCTS LABORATORY,
MADISON, WISCONSIN.



TEST FLASK WITH SPORULATING FRUIT-BODY OF *LENTINUS LEPIDEUS* GROWING UP THROUGH COTTON PLUG AND PUSHING OFF THE MUSLIN CAP. CULTURE ABOUT 9 MONTHS OLD

THE EARTH-INHABITING SPECIES OF ASCOBOLUS

Fred J. Seaver

(With Plate 184, Containing 8 Figures)

Most of the species of the genus *Ascobolus,* which genus is characterized by the beautiful violet color of the spores, occur on the dung of animals of various kinds. Those forms which occur on other substrata are the exception rather than the rule. A few species occur on damp soil and these are the species which are treated in the present paper.

Of the earth-inhibiting species of *Ascobolus,* one species, *Ascobolus carbonarius* P. Karst. has been frequently collected in North America. In 1905 a second species was collected by the writer on damp soil along the banks of the Iowa River. This species was referred to *Ascobolus viridis* Curr. Since that time, the same species has been frequently collected on soil in New York State. Dodge in his morphological studies of the Ascobolaceae has noted the difference in the spores of the American and European specimens and has considered the American plants a possible variety of the European species. Comparative study of the two forms has convinced the writer that they represent two distinct species. The spores of the European plants are a third larger than those of the American and have an entirely different form as shown in the accompanying illustrations. The American plants are therefore redescribed below as *Ascobolus geophilus.*

In August, 1914, a species of *Ascobolus* was collected on damp soil in woods near Yonkers, New York, which was taken to be *Ascobolus viridis* of American authors. The spores however were almost globose. At first, this was thought to be only an extreme variation of the common species. During September of the same year, similar plants were collected in considerable quantity on Staten Island where they grew on damp soil on the bank of a little pond. In all of these plants the mature spores would pass as globose. The young spores, however, are found to be

slightly ellipsoid. In addition to their form the spores when mature are covered with crevices which are so deep as to give to the outside of the spore a peculiar ragged appearance. As they mature, the spores become so dark that they are almost opaque. This species is also regarded as distinct and described below as *Ascobolus subglobosus.*

In June, 1914, still another earth form had been collected which differed from any listed above in the fact that the apothecia were entirely white except the hymenium, which became darkened by the maturing spores. The spores and asci of this species were identical, so far as the writer could determine, with those of *Ascobolus carbonarius* but both color and habitat seemed to distinguish it from that species. *Ascobolus carbonarius* is restricted to burned places while this species grew on soil where there was no trace of fire. It may be that these plants represent only an albino form of *Ascobolus carbonarius* and that the white color is due to the fact that the plants have grown on an unfavorable substratum. The form is here listed as *Ascobolus albinus.* The following is a synopsis of the earth-growing species of *Ascobolus* as at present known for North America.

ASCOBOLUS Pers. in L. Syst. Nat. 1461. 1791.

Apothecia sessile, or stipitate, superficial or partially immersed in the substratum, externally smooth or pilose; hymenium concave, plane or convex; substance soft, fleshy or waxy, usually greenish; asci cylindric to clavate or subovoid, 4–8-spored; spores becoming blue or purple, fading to brown or blackish, ellipsoid to subglobose; smooth or rough; spore-roughenings very variable often consisting of crevices or cracks which give to the surface of the spore a reticulate appearance; paraphyses slender and usually adhering together in fascicles or clumps.

Type species, *Peziza stercoraria* Bull.

Plants restricted to burned areas.	1. *A. carbonarius.*
Plants not restricted to burned areas.	
Apothecia white, spores verrucose.	2. *A. albinus.*
Apothecia greenish to blackish, spores reticulate.	
Spores ellipsoid.	3. *A. geophilus.*
Spores subglobose.	4. *A. subglobosus.*

1. ASCOBOLUS CARBONARIUS P. Karst, Fungi Fennici *463*. 1866

Ascobolus atrofuscus Phill. & Plow. Grevillea **2**: 186. 1873.
Ascobolus carbonicola Boud. Bull. Bot. Soc. Fr. **24**: 310. 1877.
Phaeopezia Nuttallii Ellis & Ev. N. Am. Fungi *2908*. 1893.

Apothecia scattered or more often crowded into congested masses several cm. in diameter, at first globose or subglobose, expanding and becoming scutellate, reaching a diameter of 4–5 mm., externally yellowish-green, becoming dark-brown, coarsely granular; hymenium plane or nearly plane with the margin slightly elevated, at first greenish, becoming dotted over with the ends of the protruding asci, gradually becoming darker, finally almost black; asci clavate, gradually tapering below into a long slender stem-like base, reaching a length of 200–225 μ and a diameter of 23–27 μ, 8-spored; spores 1-seriate or crowded together so as to become partially 2-seriate, ellipsoid with the ends rather strongly narrowed, thick-walled, the ends often capped with a thickening of the epispore, giving the spore a truncate appearance, hyaline, becoming violet, finally brown or brownish-black, 20–24 $\times$ 12–14 μ including roughenings; spore-roughenings taking the form of wart-like projections, the spaces between appearing lighter, giving rise to reticulate markings; paraphyses about 3 μ in diameter and scarcely thickened above, embedded in greenish-yellow mucilaginous substance.

On burnt places and on charcoal beds.

TYPE LOCALITY: Finland.

DISTRIBUTION: New York to Iowa and West Virginia.

ILLUSTRATION: Ann. Sci. Nat. V. **10**: *pl. 5, f. 4* (as *Ascobolus viridis* Curr.); Bull. Lab. Nat. Hist. State Univ. Iowa **6**: *pl. 29, f. 1;* Bull. Torrey Club **39**: *pl. 10, f. 9, 10, 11.*

EXSICATTI: Ellis & Ev. N. Am. Fungi *2908* (as *Phaeopezia Nuttallii* Ellis & Ev.).

2. **Ascobolus albinus** sp. nov.

Apothecia gregarious, at first subglobose, expanding and becoming scutellate, reaching a diameter of 4–5 mm., externally pure white, minutely rough; hymenium plane or nearly plane, at first whitish, becoming darkened by the maturing spores; asci cylindric or subcylindric, 8-spored, reaching a length of about 200 μ and a diameter of about 25 μ; spores at first obliquely 1-seriate, becoming 2-seriate or irregularly crowded, ellipsoid, be-

coming purple then brown, 20–26 × 12 μ, rough; spore roughenings consisting of minute warts; paraphyses very slender, hyaline.

On damp soil in woods.

TYPE LOCALITY: Woods, near Yonkers, New York.

DISTRIBUTION: Known only from the type locality.

3. **Ascobolus geophilus** sp. nov.

Apothecia scattered, gregarious, or more rarely crowded, at first subglobose, expanding, becoming scutellate to discoid, reaching a diameter of 5 mm., externally greenish-yellow, furfuraceous to nearly smooth; hymenium plane or slightly concave, similar in color to the outside of the apothecium, roughened by the protruding asci and becoming darker as the spores mature, finally almost black; asci clavate, gradually tapering below into a stem-like base, reaching a length 200–250 μ and a diameter of 15–18 μ, 8-spored but often with only 4 spores developed; spores 1-seriate, becoming 2-seriate or irregularly crowded, ellipsoid, at first hyaline, becoming violet, then brown, 22–25 × 12–13 μ, becoming rough; spore-roughenings consisting of verrucose markings and reticulations, the reticulations consisting of light lines which give rise to an irregular net-work; paraphyses very slender, sparingly branched, reaching a diameter of 2 μ, scarcely enlarged above, embedded in golden-yellow mucilaginous substance.

On damp soil.

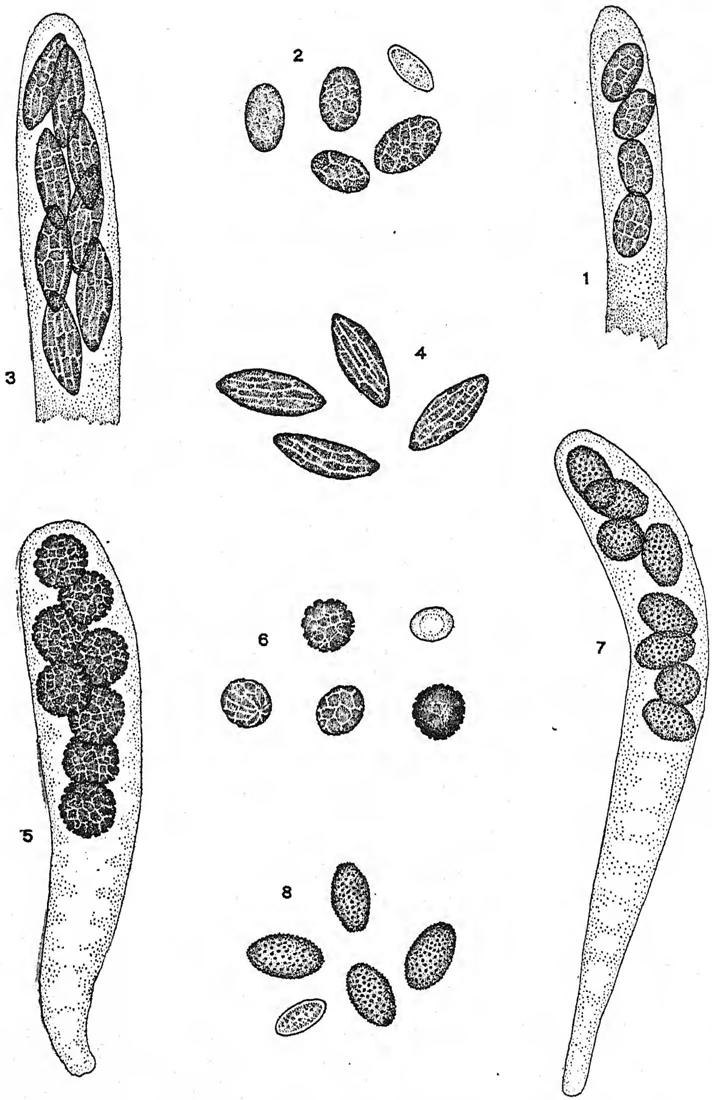
TYPE LOCALITY: Europe.

DISTRIBUTION: New York to Iowa.

ILLUSTRATIONS: Bull. Lab. Nat. Hist. State Univ. Iowa **6**: *pl. 30, f. 1.*

4. **Ascobolus subglobosus** sp. nov.

Apothecia gregarious or thickly crowded, at first nearly globose, expanding and becoming almost discoid, reaching a diameter of 3–5 mm., externally smooth, greenish-yellow; hymenium plane, convex or irregularly convolute, at first similar in color to the outside of the apothecium, becoming dotted over with the ends of the protruding asci, finally entirely black; asci subcylindric to clavate, gradually tapering below into a stem-like base, 8-spored; spores at first 1-seriate, becoming crowded and partially 2-seriate as they mature, at first hyaline and containing one oil-drop which is often surrounded by numerous smaller ones, becoming violet, finally almost black, and opaque becoming rough, reaching a diameter of 18–20 μ or 18 × 20 μ; spore-roughenings taking the form



SPECIES OF ASCOBOLUS

of numerous vein-like reticulations, which consist apparently of crevices, the spaces between the crevcies giving rise to prominent projections visible about the periphery of the spore, the spaces between appearing as notches, giving the spore a very ragged appearance; paraphyses scarcely enlarged above, embedded in golden-yellow, mucilaginous substance.

On damp soil in woods and on the margin of a small pond.

TYPE LOCALITY: Woods near Yonkers, New York.

DISTRIBUTION: Woods near Yonkers and Staten Island, New York.

NEW YORK BOTANICAL GARDEN.

EXPLANATION OF PLATE CLXXXIV

All drawings are made with the aid of the camera lucida to a common scale. 1–2, *Ascobolus geophilus* Seaver; 3–4, *Ascobolus viridis* Curr.; 5–6, *Ascobolus subglobosus* Seaver; 7–8, *Ascobolus carbonarius* P. Karst.

NEW OR NOTEWORTHY SPECIES OF FUNGI[1]

John Dearness

DISCOMYCETES

1. **Mollisia apiophila** sp. nov.

Apothecia 0.3–1 mm. when fresh, hardly visible to the naked eye when dry, flesh-color, subsessile, turbinate, height nearly equaling width; cells of hypothetical layer elongate, septate, 3–4 μ across, of ectal layer round to angular, thin-walled, 10–12 μ. Asci with paraphyses making a yellowish-hyaline stratum 75–80 μ, p. sp. 45–52 $\times$ 10–12 μ. Sporidia biseriate, 2–4 guttulate, hyaline, naviculate, 16–18 $\times$ 4–6 μ.

On preceding season's stems of *Apios tuberosa* Moench. Limited to these stems and often associated with another thin sessile *Mollisia* having much smaller sporidia and not limited to *Apios*. London, Ont., *J. Dearness 3943;* observed annually, August and September.

2. **Belonidium Macounii** sp. nov.

Apothecia cyathiform to ureceolate, sessile, dark-brown, 1 mm. in diameter, gregarious, sometimes cespitose. Asci hyaline, cylindrical, 90–96 $\times$ 7 μ, overtopped by the hyaline paraphyses, which are enlarged at the tips. Sporidia elongate, hyaline, 3-septate, 20–30 $\times$ 3 μ, in more than a single series.

On dead stems of *Spiraea Menziesii* Hook., Vancouver Island, May–June, 1915, *John Macoun.*

PYRENOMYCETES

3. **Laestadia biennis** sp. nov.

Perithecia epiphyllous, black, subglobose, perforate at or near the summit, 180–360 μ. Asci fusoid, sessile, aparaphysate, 40–50 $\times$ 7–9 μ. Sporidia sub-biseriate, nucleate near each end or guttulate, continuous, oblong-elliptic, 8–11 $\times$ 3–4 μ.

[1] Examined cotypic material or microscopic mounts of the following species will be sent to the Victoria Memorial Museum, Ottawa, Canada, the National Herbarium, Washington, D. C., and the New York Botanical Garden.

On the preceding season's basal leaves of *Solidago juncea* Ait., near Byron, Ontario, *J. Dearness 3088,* collected in 1904 and observed annually since until date.

In autumn the infected leaves are extensively discolored, red-brown to blackish-brown, usually the entire right or left half, seldom both sides of the midrib. Black, subglobose "sclerotia," mostly about 140 μ in depth and 240 μ in breadth, are thickly scattered, 3 or 4 to the sq. mm., over most of the darkly discolored area, prominent on the upper side but visible beneath, containing a white mass of coarse parenchymatic cells about 7 μ.

Specimens wintered out of doors began to show asci by the middle of April. Sporidia issued freely in sections in water in the latter half of May. This will be distributed in Fungi Columbiani.

4. **Trichosphaeria breviseta** sp. nov.

Perithecia black, crowded, appearing to the naked eye as a continuous stratum, 3 but not quite 4 to the lineal mm., globose-conic; bristles 15 to 20 μ, usually limited to the basal half of the perithecia. Asci linear, 50–75 μ, shorter than the abundant paraphyses. Sporidia uniseriate, nucleate at each end, hyaline, 6–7 $\times$ 3–3.5 μ.

On rotten coniferous wood, Victoria, B. C., April, 1915, *John Macoun.*

5. **Diaporthe Euonymi** sp. nov.

(In Euporthe). Stroma widely effused, sometimes surrounding the stem or in small patches containing one or a few contiguous perithecia, whitening the substance of the bark and causing it to adhere firmly to the wood which is marked by a black circumscribing line. Perithecia single or in small groups, 2 to 4, not circinating, partly sunk in the wood, globose, 270–500 μ in diameter; the cylindric to conic ostiola 100 μ thick, erumpent through the epidermis, 100–130 μ, in richly fertile parts closely ranked and appearing to the naked eye as black parallel lines. Asci cylindrical to fusoid, sessile, 8-spored, paraphysate, 60–75 $\times$ 11–15 μ. Sporidia obliquely uniseriate or sub-biseriate, oblong-elliptic, not constricted, septum distinct, 12–15 $\times$ 6–7 μ.

On dead stems of *Euonymus atropurpureus* Jacq., Delaware, Ontario, June, 1913, *J. H. Bowman.*

6. **Diaporthe Macounii** sp. nov.

Stromata numerous, minute, 0.5–0.8 mm., raising the substellately ruptured epidermis into flattish pustules, sometimes deciduous, exposing the yellowish cortex and thus mottling the affected twigs, not visible on the interior side of the bark although the subjacent wood is perceptibly darkened to the pith; no black circumscribing line in either cortex or wood. Perithecia single or 2–6 in a stroma, 90–275 μ; ostiola very short, not visible under lens. Asci fusoid, 30–35 $\times$ 6–7 μ. Sporidia irregularly biseriate, hyaline, 8–9 $\times$ 2.5 μ, nucleate, very obscurely uniseptate, the cells sometimes separating at the septum, the lower one smaller.

On dead stems of *Spiraea Menziesii* Hook., Vancouver Island, May, 1915, *John Macoun.*

7. DIAPORTHE COLUMBIENSIS Ellis & Ev. Proc. Acad. Nat. Sci. Phil. 1890: 233. 1890.

In the original description the host was said to be undetermined. Dr. Macoun sends a *Diaporthe* on *Nuttallia cerasiformis* T. & G., collected near Victoria, B. C., April, 1915, which agrees with the description of *D. columbiensis* E. & E.

8. **Didymosphaeria Housei** sp. nov.

Perithecia scattered, blackish-brown, raising the epidermis into small subglobose pustules 0.3 mm.; ostiola very short, almost obsolete. Asci cylindrical, short-stipitate, 65–72 $\times$ 5–6 μ, paraphysate. Sporidia smoky-brown, 1-septate, slightly constricted, compactly uniseriate, 8–9 $\times$ 4–4.5 μ, much smaller than in *Didymosphaeria Ceanothi* Cooke & Hark.

On dead stems of *Ceanothus americanus* L., Albany, New York, January, 1915, *H. D. House.*

9. **Metasphaeria Macounii** sp. nov.

Perithecia nearly black, thinly scattered, flattened at the base, globose-conic, semi-immersed in the wood, oftener only the stout conic ostiola visible, conspicuously punctating the whitened areas of the decorticated stems, large, 0.5–.75 mm. in diameter. Asci linear-cylindric, 135–170 $\times$ 7 μ, abundantly paraphysate. Sporidia hyaline, strictly uniseriate, rounded at the ends, endochrome 3-divided, 16–22 $\times$ 6–7 μ.

On dead, decorticated stems of a species of wild rose (*Rosa* sp.), Vancouver Island, B. C., June, 1915, *John Macoun.*

FUNGI IMPERFECTI

10. **Placosphaeria cornicola** sp. nov.

The affected leaves, or the affected areas thereof, turn bright red, then gradually become cinnamon color, mottled on both sides with the numerous black stromata. Stromata effused, less than 1 sq. mm., tending to become confluent. Pycnidia epiphyllous, 1–9 or more in a stroma, 40–60 μ in diameter, their positions marked by a pale-bordered perforation or stoma. Spores hyaline, oblong, 2.5–5 $\times$ 0.5–0.75 μ.

Attacking living leaves of *Cornus Nuttallii* Aud., Vancouver Island, B. C., September, 1914, *John Macoun.*

11. **Sphaeropsis lineata** Ellis and Dearness, sp. nov.

Pycnidia separate but so close together as to seem to the naked eye to be in continuous parallel lines, hemispheric, closely invested by the ruptured epidermis, 160–360 μ; ostiola short, black with a white center visible under the lens. Conidia brown, oblong-elliptic, rounded at the ends, a median nucleus often giving under low magnification the appearance of a septum, 19–24 $\times$ 9–12 μ, on basidia of about half their length.

On dead branchlets of *Acer nigrum* Michx. f., near London, Ontario, November, 1903, *J. Dearness 3046.* The late Mr. J. B. Ellis examined this species and pronounced it a new one, but he is not responsible for any errors there may be in the above description.

12. **Cytodiplospora parallela** sp. nov.

Stromata erumpent, verruciform to elongate, 0.5–2 mm., sometimes scattered, but mostly in somewhat broken parallel lines, when well developed containing 5 to 15 pycnidia or locules which in tangential section are distinctly visible by their whiteness against the black stromatic substance. Pycnidia wholly or partially immersed,—in the latter case seeming cespitose,—papillate, 90–150 μ. Conidia hyaline, pyriform, uniseptate, subsessile, 12 $\times$ 6 μ.

On *Acer nigrum* Michx. f., Byron, Ontario, October–November, 1903, *J. Dearness 3206.*

13. **Ascochyta Achlydis** sp. nov.

Spots scattered, numerous small ones 2 mm., mostly sterile and a few large ones 1 cm. or more in diameter, all with a central, sharply deliminated, thin, arid, deciduous area surrounded by a

diffuse, dark-red or purple-brown border 1–5 mm. in width. Pycnidia nearly concolorous with the arid area, epiphyllous, although visible from the under side, 150–200 μ. Conidia hyaline, obscurely 1-septate, 2–3-nucleate, rounded at the ends, 14–20 $\times$ 5–6.5 μ.

On living leaves of *Achlys triphylla* DC., Vancouver Island, June, 1915, *John Macoun*.

14. **Diplodia constricta** sp. nov.

Pycnidia thickly scattered mostly along one side of the stems, small, 0.2–0.4 mm., showing the very short ostiola through a stellate or simply cleft rupture of the epidermis. Conidia dark-brown, strongly constricted, 18–22 $\times$ 9–10 μ.

On dead stems of *Spiraea Menziesii* Hook., British Columbia, June, 1915, *John Macoun*. Of the several Diplodias on species of *Spiraea* this comes nearest *D. Spiraeae* Thüm. Sacc. Syll. III. p. 342.

15. **Diplodia Ulmi** sp. nov.

Pycnidia thickly scattered, 250–400 μ, single or in small groups, subglobose, immersed in the unaltered cortex, raising the epidermis into small pustules which are scarcely visibly ruptured by the minute ostiola. Conidia brown, elliptic, constricted, 15–17 $\times$ 9–10 μ.

On dead branchlets of *Ulmus americana* L., London, Ontario, October, 1903, *J. Dearness 3052*. The bark externally is so slightly altered in appearance that the presence of the fungus is apt to escape notice, but in a tangential shaving the black shining pycnidia strongly contrast with the pale cortex.

16. **Diplodia Nuttalliae** sp. nov.

Pycnidia seated around the lenticels through which the fungus seems to have invaded the host, slaty-brown in section but the basidial portion white, 0.5–1 mm. Conidia dark-brown when fully mature, oblong-elliptic, even or but slightly constricted at the septum, 18–24 $\times$ 7–9 μ, on basidia 4 μ thick, sometimes longer than the spore.

On *Nuttallia cerasiformis* Torr. & Gr. Victoria, B. C., April, 1915, *John Macoun*.

17. **Stagonospora Spiraeae** sp. nov.

Pycnidia scattered, nearly superficial, globose or elliptic, brown, smooth, 0.3–0.6 mm. Conidia hyaline, 3-septate, 14–20, mostly $15 \times 3\,\mu$.

On dead stems of *Spiraea Menziesii* Hook., British Columbia, May, 1915, *John Macoun.* On pale areas of the stems similar to those bearing *Belonidium Macounii* Dearness described on a preceding page, and to which it may be related. *Stagonospora Physocarpi* Ellis & Ev. has spores $25–35 \times 3–4\,\mu$.

18. **Septoria adenocaulonis** sp. nov.

Spots amphigenous, thickly scattered, on the upper side grayish-brown, nearly concealed below by the pubescence of the leaf, small, 2 to 3 mm., bounded by a sharply raised thin border. Pycnidia epiphyllous, single or a small cluster near the center of the spot, yellowish-brown, 60–75 μ, wall very thin. Sporules straight, continuous, $15–30 \times 1\,\mu$, issuing as whitish cirrhi from many of the pycnidia.

On living leaves of *Adenocaulon bicolor* Hook., British Columbia, May, 1915, *John Macoun.* This is near *Septoria Lapparum* Sacc. whose spores are subfusoid.

19. **Septoria angularis** Dearness & Bartholomew, sp. nov.

Spots scattered over the leaf, numerous, brown, becoming arid, limited when the pycnidia are well developed by a narrow, raised, sharply defined, black border, angular, 2 to 5 mm. and becoming confluent. Pycnidia black, epiphyllous, rather numerous, often marked by a whitish cirrhi, 40–90 μ. Sporules straight to strongly curved, continuous, $30–45 \times 2\,\mu$, mostly 35 μ.

On living leaves of *Solidago latifolia* L., Komoka, Ontario, June, 1913, *J. Dearness 3612.*

This comes near *S. fumosa* Pk. on *Solidago Canadensis* L. Affected leaves seem easily distinguishable and yet it might have been better to consider this a species variety of *S. fumosa.*

20. **Septoria lupincola** sp. nov.

Spots grayish-brown, determinate above, paler and less definite below, seldom crossing the midrib, 3 to 7 mm. Pycnidia dark-amber color, epiphyllous, 75–180 μ. Sporules linear, continuous, 28–70 μ, mostly about $35 \times 1–1.25\,\mu$.

On living leaves of *Lupinus perennis* L., Oakland, near London, Ontario, July, 1911, *J. Dearness 3633*. Associated with *Ascochyta Pisi* Lib. f. *Lupini, fide* Saccardo.

Septoria Lupini Hark. has sporules 4–5 μ thick. This is nearer *S. Pisi* West., but it differs in its pycnidial wall and shape and length of sporules.

21. **Septoria sanguinea** sp. nov.

Spots rusty-brown, scattered, similar on both sides, circular, about 3 mm. in diameter but extensively confluent on tips and margins. Pycnidia hypophyllous, nearly concolorous with the spot, hardly visible with the lens, wall thin, mostly about 80 μ. Sporules continuous or 1–2-septate, 28–33 × 2 μ.

On living leaves of *Ribes sanguineum* Pursh, British Columbia, September, 1914, *John Macoun*. Also at Manette, Wash., August, 1912, *E. Bartholomew*.

21a. **Septoria Macrosporia** sp. nov.

The pycnidia develop in indefinite areas of leaden color, opaque when held to the light, amphigenous, innate, thin-walled, perforate, darker than the surrounding surface, 90–180 μ. Sporules linear to linear-clavulate, mostly straight, 0–8 septate, beaded or guttulate, 60 × 3–4 μ, extreme size 120 × 4.5 μ.

On living leaves of *Chrysanthemum leucanthemum* L., London, Ont., October, 1915, *J. Dearness 3855*. Cotypic material, Fungi Columbiani 4774. The spores are much larger than those of *S. Chrysanthemi* Halsted or of *S. Chrysanthemi* Cavarra. The presence of a thin pycnidial wall separates this from *Cylindrosporium Chrysanthemi* Ellis & Dearness on Chinese chrysanthemum in the greenhouse.

22. CAMAROSPORIUM CORONILLAE Sacc. et Speg. var. SPIRAEAE Bauml. Sacc. Syll. Fung. **10**: 340. 1902.

Dr. Macoun sends a *Camarosporium* on *Spiraea Menziesii* Hook. from Vancouver Island, British Columbia, with black, gregarious, semi-immersed pycnidia 0.5–0.7 mm., containing dark-brown, muriform, oblong-elliptic conidia 14–17 × 8–9 μ, which may be the above named variety. It does not agree with *C. Spiraeae* Cooke.

23. **Leptostromella conigena** sp. nov.

Pycnidia elongate, 0.5–1.5 mm., parallel to the fiber of the bract, erumpent, carbonous, rather widely cleft. Conidia hyaline, 11–45 $\times$ 2–2.5 μ, mostly about 12 $\times$ 2.25 μ on basidia of nearly equal length.

On the outer side of bracts of cones of *Picea abies* (L.) Karst. of the preceding season's growth, London, Ontario, April, 1915, *J. Dearness, 3944.*

24. **Melanconium parvulum** Dearness & Bartholomew, sp. nov.

Acervuli 1–2 mm. across, lodged on the cortex and closely covered by the raised epidermis which opens by a circular perforation .3 mm. in diameter, through which usually the whitish core of altered cortical tissue is apparent. Conidia pyriform, brown, with a nucleus or pale center, 9–13 $\times$ 8–9 μ on basidia 10–30 $\times$ 3 μ.

On dead banchlets of *Betula populifolia* Marsh, southeast shore of Lake Huron, Ontario, Canada, May 25, 1912, *J. Dearness.* Barth. Fungi Col. *3823* is cotypic material.

25. CYLINDROSPORIUM CRATAEGI Ellis & Ev. Proc. Phil. Acad. Nat. Sci. **1894**: 372. 1894. **brevispina** var. nov.

Acervuli strictly hypophyllous, affected leaves red—pomegranate purple (Ridg.)—at first then turning brown. Sporules thicker in the proximal half, mostly straight, grumous-guttulate, obscurely 2–3-septate, 50–90 $\times$ 3–3.5 μ, leaving when completely discharged a distinct cavity in the mesophyll. As in the type the exuded conidia make a white flocculent layer over and around the acervuli.

On *Crataegus brevispina,* British Columbia, September, 1914, *John Macoun.*

26. CYLINDROSPORIUM TOXICODENDRI (Curtis in Herb.) Ellis & Ev. Proc. Acad. Nat. Sci. Phil. **1893**: 460. 1893.

Septoria Toxicodendri Curtis; Peck, Ann. Rep. N. Y. State Mus. **29**: 78. 1878. (No description.)

Gloeosporium Toxicodendri Ellis & Martin; Ellis & Ev. Jour. Myc. **1**: 116. 1885.

Septoria Toxicodendri (Curtis) Ellis & Martin, Jour. Myc. **3**: 77. 1887. (Doubtless described from herbarium material.)

Marssonina Toxicodendri Magn. Hedwigia **45**: 90. 1906.

On living leaves of *Rhus Toxicodendron* and other species.

Exsicc. N. Am. Fungi *1898, 2447 a & b;* Fungi Col. *447, 1350, 2635, 4429, 4430, 4734.*

I have had the opportunity of studying what might be regarded as two of the cotypes as well as specimens from several herbaria and several collections of my own made in widely separated localities, and find them all remarkably uniform in maculae and acervuli and varying in conidia. The synonymy is quoted to illustrate the difficulty of determining in some cases whether there is a proper pycnidium. Curtis, Peck, Ellis, and Martin took this plant to be a *Septoria* and the dark cells overlying the acervuli might be supposed to be part of a pycnidial wall. It is to be noticed that it was described both as a *Septoria* and a *Gloeosporium* by the same authors. It also illustrates another difficulty—that of determining the genus by the spore-form. In a section through a single spot cutting three acervuli there were conidia exhibiting the following variations:

$21 \times 4\,\mu$	1-septate
$18 \times 5\,\mu$	0-septate
$51 \times 3\,\mu$	3-septate
$60 \times 3\,\mu$	2-septate

Conidia from extreme, isolated, examples might very well place this species in *Marsonia,* or *Septogloeum,* or *Cylindrosporium.* Four of the Fungi Col. numbers are labeled *Marsonia* as in the above synonymy, but in one of them, on *Rhus diversiloba,* the spores in my specimen are mostly nearly $50\,\mu$, obscurely septate, and one—the longest measured—was $78 \times 3\,\mu$ in which, if there were any septa, they were quite obscured by the nucleation. In 1893, Mr. Ellis stated that he had reexamined *Gloeosporium Toxicodendri* Ellis & Martin and found that the spores ("$12–15 \times 5–6\,\mu$") had been erroneously described in Jour. Myc. **I**: 115. I have, however, seen short spores not far from these figures, but the average spore of a large number of studies certainly places this plant in *Cylindrosporium.*

27. **Cryptosporium falcatum** sp. nov.

Acervuli 40–260 μ, gregarious in irregular patches, 2–6 cm. across, erumpent in minute pustules, noticeable on account of the white masses of ejected spores. Conidia hyaline, falcate, nucleate, 20–35 $\times$ 6–8 μ, mostly about 30 $\times$ 7 μ.

On bark of the trunks of unhealthy or dead *Abies balsamea* (L.) Mill., near London, Ontario, April–May, 1915, *J. Dearness 3797*.

28. RAMULARIA LAPSANAE (Desm.) Sacc.

Oidium fusisporioides f. Lapsanae Desm.

Collected on *Lapsana communis* L. at Elora, Ont., July, 1915, *J. Dearness 3835*. The indefinite arescent areas caused by the fungus are indistinguishable from the discolorations produced by the red spider, *Tetranychus telarius*. This may account for the fact that this fungus has not hitherto been recorded here.

29. **Stemphylium nemopanthes** sp. nov.

Hyphae usually shorter than the conidia, hyaline, branched, 4–5 μ thick, making with the conidia black, gregarious tufts, 100–200 μ. Conidia irregularly pyriform, acrogenous on the hyphae and branches, 30–35 $\times$ 20–24 μ, made up of dark-brown shining cells 3–4 μ, not separating.

On outer bark of dead *Nemopanthes mucronata* (L.) Trel., London, Ontario, June, 1915, *J. Dearness 3825*.

LONDON, ONTARIO,
CANADA.

NOTES AND BRIEF ARTICLES

Professor A. J. Pieters describes and illustrates *Achlea Klebsiana* sp. nov. and *Saprolegnia Kauffmaniana* sp. nov. in the December number of the *Botanical Gazette.*

Mr. R. C. Faulwetter, of Columbia University, has been appointed plant pathologist of the Agricultural Experiment Station of South Carolina at Clemson College.

Professor Paul Sorauer, of the University of Berlin, widely known for his work on plant pathology, recently died at the age of seventy-seven years.

Professor H. H. Whetzel, of the department of plant pathology, Cornell University, and Dr. E. W. Olive, of the Brooklyn Botanic Garden, sailed for Porto Rico on February 19 to study fungi and plant diseases.

Mr. Irving E. Melhus, formerly pathologist in the Bureau of Plant Industry at Washington, is now associate professor of plant pathology in the Iowa State College, at Ames, Iowa.

Dr. J. J. Taubenhaus, associate plant pathologist of the Delaware Agricultral Experiment Station, has accepted the position of head plant pathologist and physiologist at the Agricultural Experiment Station, College Station, Texas.

At the meeting of the Society of American Bacteriologists held at the University of Illinois at the end of December, Dr. Thomas J. Burrill, formerly vice-president of the university, was elected president of the society for the coming year.

Dr. W. J. Robbins, instructor in botany in the New York State College of Agriculture, has been appointed botanist in the

Alabama Polytechnic Institute to fill the vacancy made by the resignation of Dr. J. S. Caldwell, who has been called to the Washington Agricultural Experiment Station.

Miss Mary K. Bryan has found that the nasturtium is subject to a bacterial wilt disease, which prevents blossoming, stunts the plants, and finally kills them. The causal organism is *Bacterium solanacearum* Erw. Sm. Miss Bryan's results were published in the *Journal of Agricultural Research* of August 16, 1915.

Associate Professor H. P. Barss has been promoted to be professor of botany and plant pathology at the Oregon Agricultural College in place of Professor H. S. Jackson, who recently resigned to accept the position of plant pathologist at Purdue University.

"A Honeycomb Heart-rot of Oaks Caused by Stereum subpileatum," by W. H. Long, appeared in the *Journal of Agricultural Research* of December 6, 1915. The disease is rather widely distributed in the southern United States and is one of the important heart-rots of our native oaks. The only known method of control is the destruction of all diseased timber containing the rot.

A bulletin on the "Phytophthora Disease of Ginseng," by Joseph Rosenbaum, was published by the Department of Plant Pathology of Cornell University in October, 1915. The fungus is said to resemble most closely *Phytophthora cactorum* (Cohn & Leb.) Schröt. The suggested methods of control include spraying, removal of diseased plants, deep planting, crop rotation, sterilization of the soil, and drainage.

The officers for the Botanical Society of America for the coming year are: *President,* R. A. Harper; *Vice-President,* G. T. Moore; *Treasurer,* Arthur Hollick; *Secretary,* H. H. Bartlett. The society voted to eliminate the class of membership heretofore known as fellows, but failed to create a class of honorary membership as outlined in a proposed amendment to the constitution.

In a recent circular on "Wood Decay in Orchard Trees in California," by W. T. Horne, attention is called to the frequent occurrence of rots affecting orchard trees, in many cases apple and stone-fruit trees being seriously attacked by wood-destroying fungi. The author recommends cutting out, disinfecting, and coating the wounds with asphaltum. The trees should be inspected at the end of the summer and the disinfection renewed if necessary.

Dr. N. Patouillard has an article in the *Philippine Journal of Science* for March, 1915, on fungi sent to him from the Philippines by Professor C. F. Baker. The article contains a long list of determinations and also the following new species: *Septobasidium laxum, Hymenochaete pavonia, Duportella velutina, Duportella Raimundoi, Leucoporus ameides, Leptoporus Bakeri, Leptoporus armatus, Hexagona lachnochaeta, Elmerina foliacea, Daedalea philippinensis, Ganoderma Bakeri, Ganoderma plicatum,* and *Crinipellis fragilis.*

A bulletin on "Insects as Carriers of the Chestnut Blight Fungus," by R. A. Studhalter and A. G. Ruggles, was recently published by the Department of Forestry of Pennsylvania, in which experiments with ants, spiders, beetles, flies, and other kinds of insects are outlined, and it is shown conclusively that insects are largely instrumental in the dissemination of the chestnut canker and many other injurious fungi. The bulletin also contains an interesting historical summary of the experiments thus far made with insects as carriers of fungous spores.

Professor E. A. Burt, mycologist of the Missouri Botanical Garden, visited the Garden February 12–17 to examine the collection of Thelephoraceae in the mycological herbarium. He has been publishing a series of papers on this important and difficult family, which he hopes to complete within the next three years. He will then prepare descriptions of the species for publication in *North American Flora.* Professor Burt's visit was made the occasion of a dinner to over twenty local mycologists and other botanists, given by Professor Harper on the evening of February 16 at the Columbia Faculty Club.

At the seventh annual meeting of the American Phytopathological Society, held at Columbus, Ohio, from December 28 to 31, the following officers were elected: *President,* Dr. Erwin F. Smith, Bureau of Plant Industry, Washington, D. C.; *Vice-president,* Dr. Mel. T. Cook, New Jersey Agricultural Experiment Station, New Brunswick, N. J.; *Secretary-Treasurer,* Dr. C. L. Shear, Bureau of Plant Industry, Washington, D. C.; *Councilor,* Dr. F. D. Kern, Pennsylvania State College, Pa. Dr. W. A. Orton was elected one of the chief editors of *Phytopathology,* and Professor H. T. Güssow, Dr. C. W. Edgerton, Dr. E. C. Stakman, and Dr. V. B. Stewart were elected associate editors.

A bulletin on "Melaxuma of the English Walnut," by H. S. Fawcett, has recently been published by the California Horticultural Commission. This disease causes black cankers and exudation of black sap on the large limbs and trunks of English walnut trees in Santa Barbara County and certain other counties in California. It is infectious, being caused by a species of *Dothiorella* which also attacks a willow in that vicinity, poles of which are often used to drop the lower limbs of the walnut trees. If not too far advanced, it may be controlled by cutting out the cankers and dead limbs and treating the wounds with strong lime-sulphur or with Bordeaux paste.

An important professional paper on "The Toxicity to Fungi of Various Oils and Salts, Particularly Those Used in Wood Preservation," by C. J. Humphrey and Ruth M. Fleming, recently appeared as Bulletin No. 227 of the United States Department of Agriculture. The authors conclude that the common molds are more resistant to poisons than the true wood-destroying fungi, and even among the latter group the different species show a great difference in susceptibility. The results of tests on eighteen wood preservatives at the Forest-Products Laboratory, against two wood-destroying fungi, *Fomes annosus* Fr. and *F. pinicola* (Sw.) Fr., are given. Preservatives act in a considerably different manner on these two organisms, the former being, as a rule, far more resistant.

Another bulletin on "Citrus Canker," by H. E. Stevens, has been published by the Agricultural Experiment Station of the University of Florida. This bacterial disease, caused by *Pseudomonas Citri* Hasse, has proved to be the worst plant disease that has appeared in Florida and seriously threatens the citrus industry of the state, as well as of the entire South. It affects all parts of the tree above ground and attacks most of the varieties of *Citrus* grown in Florida. The bacteria are capable of considerable desiccation and retain their vitality for long periods. The complete destruction of all infected trees is the only known effective method of checking the spread of the disease, and this must be done very promptly if it is to be successful.

The February number of *Phytopathology,* which is both large and attractive, contains a long list of important articles and also abstracts of all the papers presented at the Seventh Annual Meeting of the American Phytopathological Society at Columbus, Ohio, December 28–31, 1915. Among the articles, the following may be mentioned: "Mordecai Cubitt Cooke," by H. T. Güssow, "The leaf blotch disease of horse-chestnut," by V. B. Stewart, "Some bark diseases of citrus trees in Florida," by J. G. Grossenbacher, "International phytopathology," by Otto Appel, "Identity of Peridermium montanum with Peridermium acicolum," by George Grant Hedgcock, and "The control of experimental conditions in phytopathological research," by Alden A. Potter.

An article on the discovery of the chestnut canker (*Endothia parasitica*) in Japan by Mr. Frank N. Meyer appeared in *Science,* February 4, 1916, contributed by C. L. Shear and Neil E. Stevens. About two years ago, Mr. Meyer discovered the chestnut canker in China. In a letter dated September 20, 1915, Mr. Meyer stated that the chestnut canker was quite common in Japan, at least around Nikko, Tokio, and Yokohama, both wild and cultivated trees being attacked but showing considerable power of resistance. Mr. Meyer sent some of his collections to Dr. Shear, who found them to be absolutely identical with material collected in the United States on the wild chestnut tree. On January 8,

1916, Dr. Shear received a specimen of chestnut canker from Dr. Yamada, of the Morioka Imperial College of Agriculture and Forestry, who attributed his discovery of the disease to a familiarity with the fungus gained on a recent visit to the United States. *Endothia radicalis* is also indigenous in Japan on various hosts and has been confused with the true chestnut canker, which it very much resembles.

AN ATTRACTIVE SPECIES OF MELANOLEUCA FROM OREGON

Melanoleuca olivaceiflava Murrill, sp. nov.

Pileus fleshy, convex to subexpanded, solitary, 2.5–3 cm. broad; surface smooth, dry, opaque, subtomentose, soft like a kid glove, not striate, very dark olivaceous, margin concolorous, entire, inflexed on drying: lamellae sinuate-adnexed, crowded, broad, ventricose, flavous: spores oblong-ellipsoid, smooth, hyaline, $12–16 \times 4–5.5 \mu$: stipe short, thick, tapering downward, solid, fleshy, flavous, becoming brownish when bruised, 2 cm. long, 8 mm. thick.

Type collected on the ground in mixed woods at Corvallis, Oregon, November 6–11, 1911, *W. A. Murrill 948* (herb. N. Y. Bot. Gard.). This species is very conspicuous on account of its dark-olive pileus and bright-yellow lamellae and stipe. The spores are also quite remarkable, being very long and narrow. The plant is known only from the original collection.

W. A. MURRILL.

INSECTS AND MUSHROOMS

In Henri Fabre's "The Life of the Fly," a translation of which has been published by Dodd, Mead, and Company, there is a chapter devoted to insects and mushrooms, in which reference is first made to the widespread belief that mushrooms eaten by insect larvae are safe for human beings. The author then proceeds to describe in an interesting way what he observed in the neighborhood of Sérignan.

Of the chewing insects, he mentions four beetles and a moth-caterpillar. One of the beetles specializes on *Pholiota aegerita*, one attacks *Polyporus hispidus*, and the other two are partial to truffles. The caterpillar, about one fifth of an inch long, is the habitual boarder of all kinds of fleshy agarics and boleti. The

chewers, to which group may be added the snails, all dig clean passages and break their food into minute particles. The flies, on the other hand, when in the maggot stage liquefy the flesh of the mushroom, dissolving it by means of a special pepsin as do the bluebottle maggots of meat.

The caterpillar and the maggots, as observed by Fabre, greedily devoured *Boletus Satanas,* but refused all species of *Amanita,* whether edible or poisonous; while the mild *Lactaria deliciosa* and the acrid *Lactaria torminosa,* the poisonous *Pleurotus phosphoreus* and the edible *Pleurotus Eryngii,* proved equally attractive to these insects. The author concludes that the selection of mushrooms by insects is no criterion for the human mycophagist.

Then follows a *very inaccurate and dangerous statement,* to the effect that no one was ever poisoned at Sérignan by eating mushrooms because it was the custom to "blanch" them, or bring them to the boiling point in water with a little salt added, and then to rinse them a few times in cold water. The "poisonous" species mentioned as treated in this way are *Armillaria mellea, Boletus Satanas, Lactaria zonaria, Amanita pantherina, Amanita muscaria,* and *Pleurotus phosphoreus;* some of which are entirely harmless, some are rendered harmless by boiling, and the rest contain as their active poisonous principle the alkaloid muscarin, which is soluble in hot water. If *Amanita phalloides* had accidentally come into the experiment, the conclusion would have been very different. Romell, of Sweden, doubted *Entoloma lividum* and tried boiling it for five minutes and throwing the water away;—he narrowly escaped death.

Attention is called to Dr. Clark's note on this subject in *Mycologia* for July, 1912, which closes with the following statement: "*Amanita phalloides* still preserves its toxic principle unchanged after being heated to boiling for some time; in the dried state its toxicity is not weakened after standing a year nor has it lost its poisonous properties after remaining dry for six years; the poison is still held in the tissues of the mushroom after boiling with water.

"Therefore it is very unwise to spread broadcast the erroneous idea that all poisonous mushrooms may be rendered harmless by boiling with water and then washing repeatedly in cold water."

W. A. MURRILL.

MARASMIUS ON SUGAR CANE

Fulton in Bulletin No. 100 of the Louisiana Experiment Station reported *Marasmius plicatus* on sugar cane. His description of "stipe whitish" differs so much from that of the original *M. plicatus* Wakker as to lead one to suspect another fungus. My own dried material of *Marasmius* on sugar cane from Louisiana and Texas answers to the description of *M. stenophyllus* or its synonym *M. semiustis*. As I recall the form in the field, the pileus occasionally presents a purplish color. This corresponds with material occurring on sugar cane in Cuba and common on certain varieties of banana. Dr. Murrill identified my material from sugar cane and banana as *M. stenophyllus.*

Unfortunately, no one in this part of the world has been able to compare material with the original *M. plicatus* described by Wakker and Went, from Java, but nevertheless all the available evidence seems to show clearly that the species of *Marasmius* parasitic on sugar cane in the Southern United States and occasionally parasitic on sugar cane and common on bananas in Cuba is *M. stenophyllus.*

The more common species of *Marasmius* on sugar cane is commonly known as *M. Sacchari.* This answers well to the original description by Wakker and Went, and, moreover, Went identified material in Trinidad as such (see Went, "Waarnemingen en opmerkingen omtrennt de Rietsuiker industrie in West Indie"). *M. Sacchari* appears to occur throughout the West Indies as a parasite of sugar cane and to its damage is assigned the main reason for giving up the Bourbon cane and the adoption of seedling and other varieties. *M. stenophyllus* is reported on bananas in many West Indian islands, but has not been reported before on sugar cane.

These two species are very similar, although *M. stenophyllus* occasionally has a purplish pileus, while *M. Sacchari* never does so far as I know. The only safe criterion for separating the species is the spore form and size, the spores of *M. stenophyllus* being ellipsoid, $7–9 \times 5–6\ \mu$, and the spores of *M. Sacchari* being irregularly elongate, often slightly curved, larger at one end than at the other, and $16–20 \times 4–5\ \mu$.

J. R. JOHNSTON.

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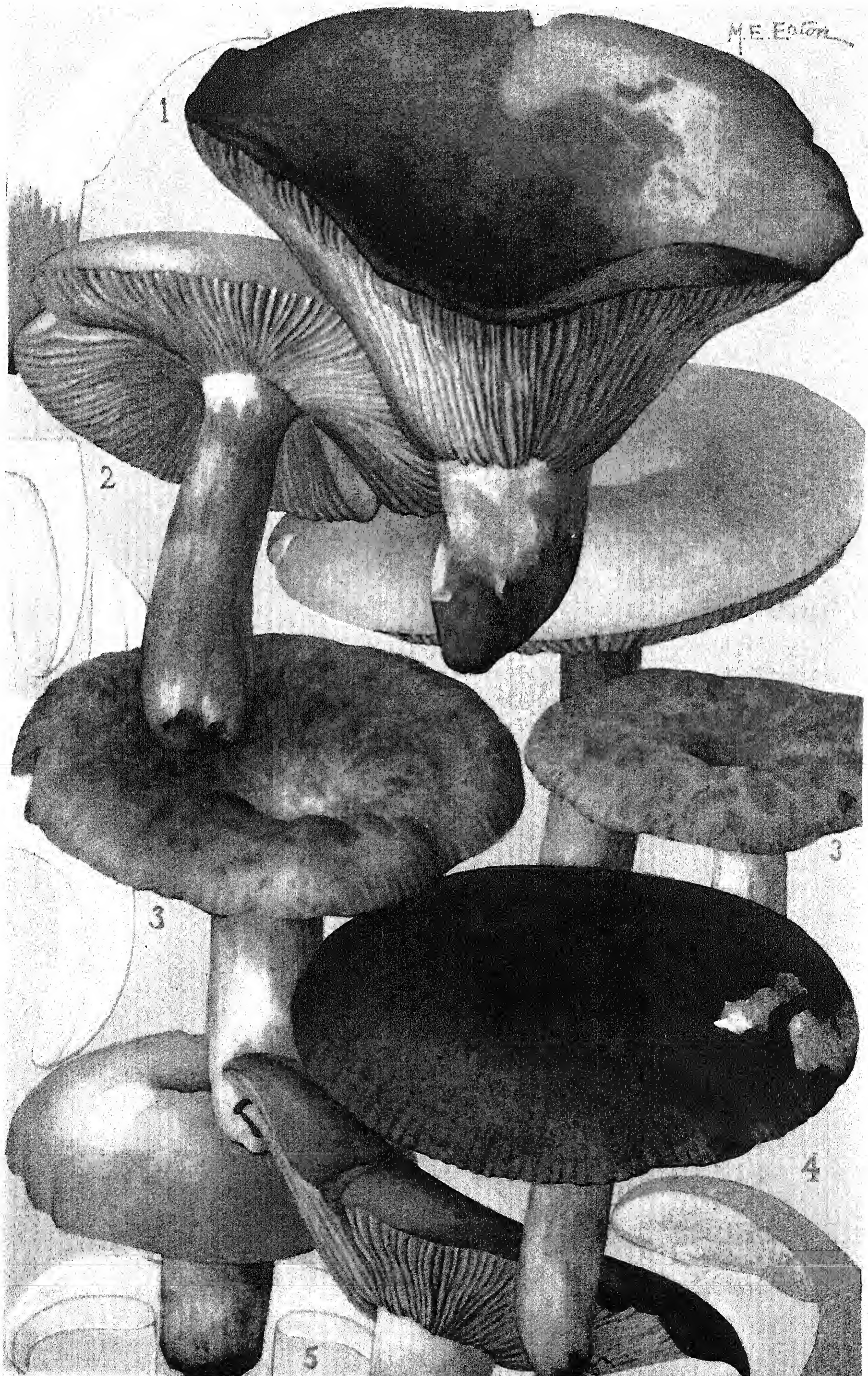
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MYCOLOGIA

VOL. VIII MAY, 1916 No. 3

ILLUSTRATIONS OF FUNGI—XXIII

WILLIAM A. MURRILL

In *Mycologia* for January, 1916, an index was given to the species illustrated in the first 22 articles of this series, the drawings of which were prepared by Mr. Edward C. Volkert. The plate accompanying the present article is from original studies by Miss Mary E. Eaton; and the descriptions are largely taken from Dr. Burlingham's monograph of the American species of *Russula* recently published in Volume 9, part 4, of *North American Flora*. For descriptions of the 13 species of *Russula* previously figured in this series, see *Mycologia* 4: *pl. 68, 76,* and 7: *pl. 160, 163.*

Russula delica Fries

SHORT-STEMMED RUSSULA

Plate 185. Figure 1. × 1

Pileus fleshy, of medium thickness, firm, broadly convex-umbilicate, then spreading, and at length infundibuliform, 8–16 cm. broad; surface white, sometimes with yellowish stains when the pileus has brought soil up with it, easily staining yellowish in drying, dry, glabrous or sometimes under the lens appearing obscurely tomentose from the pulling apart of the fibers in the outer layer; margin even, involute, late in expanding; context firm, white, unchanging where bruised, slowly becoming slightly acrid; lamellae white, the edges often becoming faintly glaucous-green when mature or in the process of drying, becoming yellowish where

[MYCOLOGIA for March, 1916 (8: 65–120), was issued April 11, 1916.]

rubbed, some equal, some forking, narrowed at both ends, decurrent, subdistant to distant, rather narrow; spores subglobose, hyaline, tuberculate, $10 \times 9\,\mu$; stipe white, sometimes with a glaucous-green ring at the apex, glabrous or sometimes slightly downy at the apex under a lens, 2–5 cm. long, 1–2 cm. thick.

Found commonly in dry woods, especially under conifers, from Maine to Alabama and west to Colorado. It very much resembles *Lactaria piperata*, but is without milky juice and the hymenium is usually tinged with glaucous-green. Peck includes it in his list of edible fungi and remarks that it is excellent fried in butter. It is more compact and lasts longer than most species of *Russula*.

Russula flava Romell

YELLOW RUSSULA

Plate 185. Figure 2. × 1

Pileus fleshy, broadly convex, becoming plane or slightly depressed at the center, 5–8 cm. broad; surface flavous or golden-yellow, sometimes discolored with age, viscid when wet, glabrous; margin even to slightly striate when mature; context white, becoming gray with age and in drying, the taste mild; lamellae white, becoming pale-yellow, then gray with age, equal, not forking, adnexed, close, broader at the outer ends; spores pale-yellow, globose, echinulate, 8–9 μ in diameter; stipe white, becoming more or less gray with age or in drying, nearly equal, obscurely reticulate-rivulose, spongy, 5–8 cm. long, 1–2 cm. thick.

Found in mixed woods from New England westward to Michigan. Unfortunately, neither this species nor the two other beautiful yellow species, *Russula lutea* and *Russula flavida*, are very abundant.

Russula virescens (Schaeff.) Fries

GREEN RUSSULA

Plate 185. Figure 3. × 1

Pileus fleshy, globose, becoming convex, then nearly plane and often centrally depressed, 5–12 cm. broad; surface green or grayish-green, dry, with small, flocculose patches or warts resembling

those of *Venenarius;* margin even, rarely slightly striate in old specimens; context white, mild to the taste; lamellae white, a few short ones present, some forking, narrow toward the stipe and nearly or quite free, rather crowded; spores subglobose, echinulate, hyaline, $8 \times 7\,\mu$; stipe white, firm, nearly equal, 2.5–5 cm. long, 1.2–2 cm. thick.

Found in oak, maple, or mixed woods from Maine to Virginia and westward to Michigan and Ohio. This beautiful species has long enjoyed a reputation for edibility, but, unfortunately, it is rather rare and its flavor is not really of first rank. It may be recognized by the greenish color and warted appearance of its pileus. The pileus of *Russula furcata,* a bitter species formerly considered poisonous, is green but not warted. The green form of *Venenarius phalloides* and the poisonous *Entoloma lividum,* both common in Europe, are easily distinguished by other characters.

Russula obscura Romell

OBSCURE RUSSULA

Plate 185. Figure 4. × 1

A paler form of this species was figured and described in *Mycologia* for November, 1912. The color is usually dull-dark-red as here represented, the disk often being blackish. The species usually occurs on the ground in coniferous woods and is known from New England, New York, and Mississippi.

Russula compacta Frost & Peck

COMPACT RUSSULA

Plate 185. Figure 5. × 1

Pileus fleshy, broadly convex, sometimes umbilicate, becoming centrally depressed or infundibuliform, 7.5–15 cm. broad; surface white or whitish, becoming rusty-ochraceous, dry or subviscid after heavy rains, unpolished, glabrous, margin even; context compact, white, mild or slightly and tardily acrid, the odor in drying strong and disagreeable; lamellae white, becoming reddish-brown where wounded and smoky-brown in drying, unequal, oc-

casionally forked, rather crowded to subdistant, adnate or slightly rounded behind; spores globose to subglobose, nearly smooth, hyaline, 7μ in diameter; stipe white but becoming stained with reddish-brown in handling or where wounded, and sometimes changing color like the pileus, equal or nearly so, solid, 3.5–6.5 cm. long, 1.2–2.5 cm. thick.

Found in pine groves or mixed woods in New England, New York, and New Jersey. Peck says it is edible. The flesh is firm as in *R. delica, R. nigricans,* and other members of the *Compactae.*

NEW YORK BOTANICAL GARDEN.

CULTURES OF UREDINEAE IN 1915[1]

J. C. Arthur

The present article is the fourteenth of a series of reports[2] by the writer upon the culture of plant rusts, beginning in 1899 and completing seventeen consecutive years. With this report it is proposed to bring the series to a close. Hereafter the record of such cultures as may be undertaken will be made in whatever connection may be found advantageous. To render the work brought together in the present series more readily accessible, and to make clear the changing point of view dominating the work, it is proposed to prepare an index and a brief historical statement, to be issued in the early future.

During the year 1915, little traveling was undertaken for the purpose of securing culture material and information. Two trips were made by the writer, the first one in April, the second in June, the first one in company with Mr. H. E. Ford, in order once more to explore the Kankakee marshes, in the northern part of Indiana, especially to gather information about *Puccinia Seymouriana* on *Spartina*. The rust was found in the greatest profusion, and specimens were taken from different parts of the region. Only one of these specimens showed viability, without much strength, and no infection was obtained from it. It is difficult to surmise what could cause such low viability, especially as the winter was mild and favorable to vegetation.

Correspondents in various parts of the country, as in previous years, have sent material for cultures, of both the rusts and the living host plants. A number of correspondents took extra trouble to respond to requests for particular species, and to such

[1] Presented before the Botanical Society of America at the Columbus meeting, December 30, 1915.

[2] See Bot. Gaz. **29**: 268–276; **35**: 10–23; Jour. Myc. **8**: 51–56; **10**: 8–21; **11**: 50–67; **12**: 11–27; **13**: 189–205; **14**: 7–26; Mycol. **1**: 225–256; **2**: 213–240; **4**: 7–33, 49–65; **7**: 61–89.

especially not only the writer feels much indebted but the scientific public is placed under obligation. Among those who contributed in more or less degree to the studies of the present year the following are especially entitled to mention: Messrs. F. McAllister, I. M. Lewis and B. C. Tharp, Austin, Texas; W. A. Archer, Mesilla Park, N. Mex.; J. M. Bates, Red Cloud, Neb.; E. Bartholomew, Stockton, Kans.; E. Bethel, Denver, Colo.; J. F. Brenckle, Kulm, N. Dak.; H. L. Bolley, Fargo, N. Dak.; J. J. Davis, Madison, Wis.; A. O. Garrett, Salt Lake City, Utah; H. D. House, Albany, N. Y.; H. S. Jackson, Corvallis, Ore.; C. H. Kauffman and E. B. Mains, Ann Arbor, Mich.; Roy Latham, Orient, N. Y.; W. H. Long, Albuquerque, N. Mex.; C. R. Orton, State College, Pa; J. L. Weimer and H. H. Whetzel, Ithaca, N. Y.

To indicate the extent of the work in making the cultures here reported the following statistics may be given. There were available 118 collections with resting spores, and 18 with active spores, *i. e.*, taken from growing plants. Over 240 tests were made in a hanging drop to determine the germinating condition of the spores. Only 48 collections of resting teliospores could be brought to germination, from which 110 sowings were made, and 16 infections secured. From the 18 collections of fresh spores 34 sowings were made, and 3 infections obtained No extra assistant was employed for the work, as has been customary in preceding years, but it was carried forward by the regular staff of the laboratory, the larger share falling to Mr. H. C. Travelbee.

NEGATIVE RESULTS.—A number of collections giving good germination of spores produced negative results when sown upon hosts which are presumably aecial hosts for the species, but possibly not adapted to the racial material in hand. A few collections of species, for which no definite suggestions were available, were sown upon the seemingly most likely aecial host. In both cases the lack of positive results appears worth recording.

1. PUCCINIA AMPHIGENA Diet., on *Calamovilfa longifolia* (Hook.) Hack., collected by Mr. E. Bethel at Colorado Springs, Colo., Oct. 18, 1914, and sent immediately to Lafayette, Ind.,

was sown March 31, on *Smilax hispida;* another collection from the same locality, made May 16, 1915, was sown on another plant of the same host May 24, both without infection. The leaves of the two collections sent by Mr. Bethel were thickly covered with the prominent, blackish telia. The teliospores germinated well, especially so in the October collection. Mr. Bethel stated on the label of the latter specimen that although the rust was very abundant, there were no *Smilax* plants in the region. In sending the May collection he stated on the label that the aecial stage occurred on *Leucocrinum,* but desired to have the material tested on *Smilax.* In the accompanying letter of same date he says: "I am inclosing *Puccinia amphigena* on *Calamovilfa longifolia,* which I wish you would sow on *Smilax,* which I believe you give as host in the east. I have fine young plants of native *Smilax,* but have failed to inoculate them. With us this does not normally belong to *Smilax,* and may be another race. It belongs to *Leucocrinum,* on which it is epidemic everywhere this year." This species of rust was first cultured on *Smilax* in 1902, from telial material gathered at Callaway, Neb., and in the year following from material gathered at the type locality in Chicago, Ill. It has been cultured altogether six times,[3] the westernmost locality for telial material being central Nebraska, on the plains, some two hundred miles from the foothills of the Rocky Mountains, where this season's material was obtained.

2. PUCCINIA EMACULATA Schw., on *Panicum capillare* L., collected at Lafayette, Ind., was sown, May 21, on *Euphorbia corollata,* having shown strong germination, but without results. The reasons for this attempt, with citation of other trials, are given in the previous report of cultures.[4]

3. PUCCINIA SIMILLIMA Arth., on *Phragmites communis* Trin., collected by Dr. J. F. Brenckle, at Wiedmer's Lake, N. Dak., on April 11, 1915, was sown May 14, on *Anemone cylindrica* and *Ranunculus acris,* without infection. It was sown again June 18 on two plants of *Ranunculus sceleratus,* but with no infection.

[3] See Bot. Gaz. 35: 20. 1903; Jour. Myc. 10: 11. 1904; 12: 16. 1906; 14: 15. 1908; Mycol. 2: 225. 1910; and 4: 18. 1912.

[4] Mycol. 7: 65. 1915.

This species was successfully cultured in 1902 and again in 1907 on *Anemone canadensis*.[5] A recent monographic study of American grass rusts confirms the early opinion[6] that this species is similar, morphologically and in host requirements, to *P. Magnusiana* of Europe, which has been found to have aecia on *Ranunculus acris* and *R. bulbosus*. Aecia were collected by Dr. Brenckle on *R. sceleratus*, May 30, 1908, near Kulm, N. Dak., which are structurally similar to the American form on *Anemone*, as well as to the European form on *Ranunculus*. An appeal to Dr. Brenckle for living plants of *R. sceleratus* was met with some difficulty upon his part, but successfully, and telial material also was sent from a locality not far away from the place where aecia on *R. sceleratus* had been obtained, but nothing definite has been proven. It still seems probable, however, that *P. simillima* is but a racial variant of *P. Magnusiana*, and that a race may finally be found in America with aecia on *Ranunculus*, although the common form is on *Anemone*.

4. PUCCINIA RHAMNI (Pers.) Wettst., on *Notholcus lanatus* (L.) Nash (*Holcus lanatus* L.), sent by Prof. H. S. Jackson from Corvallis, Ore., was sown April 2 on *Rhamnus cathartica* and *Lepargyraea canadensis*, with no infection. Another collection of the rust on *Scolochloa festucacea* (Willd.) Link, sent by Dr. J. F. Brenckle from Kulm, N. Dak., was sown May 8 on *Lepargyraea canadensis* and *Eleagnus argentea*, and again May 21 on *Rhamnus cathartica*, all without infection. Aecia are known to be common about Corvallis on *Rhamnus Purshiana*, but not found on *Lepargyraea*, the host being absent from the region, while at Kulm aecia are common on *Eleagnus*, but whether the latter belong to a race of *P. Rhamni*, or to an independent species is not yet known.

5. PUCCINIA AGROPYRI E. & Ev., on *Hordeum jubatum* L., sent by Dr. Brenckle from Wiedmer's Lake, N. Dak., was sown May 13 on *Anemone cylindrica, Clematis ligusticifolia*, and *Aquilegia* sp., without infection. Recent monographic study of the

[5] Bot. Gaz. 35: 20. 1903; and Jour. Myc. 14: 15. 1908.

[6] Arthur, The Uredineae occurring upon *Phragmites, Spartina* and *Arundinaria* in America. Bot. Gaz. 34: 18. 1902.

grass rusts has shown the probability that this form, usually reported under the name *P. rubigo-vera,* is a part of the comprehensive species, *P. Agropyri,* with aecia on different Ranunculaceous hosts, forming well defined races.[7]

6. UROMYCES SCIRPI (Cast.) Burr., on *Scirpus fluviatilis* (Torr.) A. Gray, sent by Dr. J. F. Brenckle from Kalmbach Lake, Lamoure Co., N. Dak., was sown March 26 on *Sium cicutaefolium* and *Hydrocotyle australe,* and again May 19 on other plants of the same two species, without infection. The species apparently is made up of races, a study of which was the aim in this attempt at cultures.[8]

7. UROMYCES ARCHERIANUS Arth. & Fromme, on *Chloris elegans* H. B. K., collected Nov. 12, 1914, and again Feb. 7, 1915, by Mr. W. A. Archer, at Mesilla Park, N. Mex., was sown April 15, each collection on a different plant of *Chenopodium album,* with no infection. This new species of rust was discovered in abundance upon the campus of the New Mexico Agricultural College, with no distinctive aecia in the vicinity. Because of its morphological resemblance to *Uromyces Peckianus,* it was tried upon *Chenopodium.*

8. AECIDIUM IRIDIS Ger., on *Iris versicolor* L., from the Renwick Swamp, Ithaca, N. Y., was sent by Mr. J. L. Weimer in abundance and in excellent condition, and on July 1, the third day after collection, was sown on a large and especially thrifty plant of the same species of *Iris,* but gave no infection. A test of the spores showed that seventy-five to ninety per cent. were in germinating condition. Field observations have given little or no grounds for considering this rust autoecious, and the present trial further emphasizes this view. However, up to the present time no one has detected a probable alternate host.

SUCCESSFUL CULTURES SUPPLEMENTING PREVIOUS WORK.—The facts derived by growing the following species of rusts supplement in a variety of ways the facts obtained from previous cultures in this series from cultures recorded by other American

[7] For previous attempts at cultures see Mycol. 2: 219. 1910.

[8] For previous culture work see Jour. Myc. 13: 199. 1907; 14: 17. 1908; Mycol. 1: 237. 1909; and 7: 83. 1915.

or European investigators. The extension of aecial hosts for *Puccinia Seymouriana* to two families not closely related to the one previously known is especially important, and the behavior of rye rust upon *Anchusa* appears to have significance.

1. PUCCINIA EXTENSICOLA Plowr. (*P. Dulichii* Syd.).—A collection of this rust on *Dulichium arundinaceum,* made at DeMotte, in the Kankakee marshes of northern Indiana, by Mr. H. E. Ford and the writer on April 6, 1915, was sown April 19, on two plants of *Aster paniculatus,* one brought from the spot where the collection was made, and the prevailing plant at the place, and also on a plant of *Solidago canadensis.* Abundant pycnia began to show on the *Solidago* April 26, and aecia May 9, while the two *Aster* plants were unaffected. The result agrees with the facts obtained in 1914[9] with similar material from Florida.

2. PUCCINIA GROSSULARIAE (Schum.) Lagerh.—Material collected by Mr. Roy Latham at Greenport, Long Island, N. Y., on *Carex tenuis,* was sown March 25 on *Ribes floridum* with no infection, and March 31 on *R. Cynosbati,* giving rise to pycnia April 13, and aecia May 4. The aeciospores thus produced were sown May 4 on *Carex pubescens,* with no infection. Another collection made by C. H. Kauffman and E. B. Mains at Lake Placid, N. Y., on *Carex arctata,* was sown March 15, on *Ribes Cynosbati,* giving a few pycnia March 26, but failing to develop further on account of injury to host. The same material was sown again March 26 on another plant of the same sort, giving pycnia April 2, and aecia April 26, the growth being slow. Both the original telial collections gave many urediniospores, all of which appeared to have but one basal pore, and they may be considered pure representatives of *Puccinia uniporula* Orton. The aecia were not distinguishable from those grown in previous years from material showing equatorially three-pored urediniospores. It was hoped that aecia so grown might be carried back to the telial host, and the character of the resulting urediniospores ascertained, but although an attempt was made, it failed.

A collection of aecia on *Ribes longiflorum* sent from Denver, Colo., by Mr. E. Bethel, was sown June 4, two days after collec-

[9] Mycol. 7: 81. 1915.

tion, upon *Carex durifolia,* a species from which the aecia were supposed to have been derived, and also upon *C. Jamesii,* with no infection.[10]

3. PUCCINIA ERIOPHORI Thüm.—Observations by Dr. H. D. House of the New York State Museum, made near Oneida, N. Y., in June of this year, led to the recognition of this species of rust in America and the discovery of the alternate stage. On June 27 Dr. House wrote that "of thousands of plants of *Senecio* in the marsh practically every one is affected by the *Aecidium.*" He found that of the numerous marsh plants the one having a corresponding abundance of rust on the dead leaves from the preceding year was *Eriophorum viridi-carinatum.* At the same time he sent growing plants of both the *Senecio* and *Eriophorum,* the former with leaves well spotted with aecia. All the plants continued to flourish.

On June 30 a sowing of aeciospores from *Senecio aureus* was made on the young leaves of *Eriophorum viridi-carinatum.* After twenty-four hours a test of the spores remaining on the leaves of the *Eriophorum* showed that from twenty to forty per cent. of them were germinating. Daily observation of the plant was not made, but on July 15 both uredinia and telia were found to be present. The rust on American species of *Eriophorum* is morphologically very similar to *Puccinia angustata* Peck on various species of *Scirpus,* and usually has been listed under that name. As *P. angustata* has its alternate stage on the labiate, *Lycopus,* the same had been supposed to be true of the rust on *Eriophorum,* and thus to differ from the similar rust in Europe.

Tranzschel[11] has reported the infection in 1907 of *Ligularia sibirica* (*Senecio cacaliaefolius*) and *Senecio paluster* (*Cineraria palustris*) from teliospores on *Eriophorum angustifolium,* and has listed the European stations for the rust, showing that it is quite rare. In America it has been taken on *Eriophorum angustifolium* Roth, at Decorah, Iowa, June 29, 1884, *E. W. D. Holway,* Kennedy, Neb., July 20, 1892, *J. M. Bates,* Newfane, Vt., Oct. 16,

[10] For previous cultures see Jour. Mycol. 12: 58. 1905; 12: 14. 1906; 13: 196. 1907; 14: 13. 1908; Mycol. 4: 13. 1912; and 7: 66, 78. 1915.

[11] Beiträge zur Biologie der Uredineen, III.

1892, *A. J. Grout;* on *E. polystachyon* L., Mt. Hood, Ore., at 5,000 feet altitude, July 23, 1915, *H. S. Jackson;* on *E. tenellum* Nutt., at Isle au Haute, Me., Sept. 11, 1899, *J. C. Arthur;* on *E. virginicum* L., at Avilla, Ind., August, 1884, *W. B. VanGorder,* Granville, Mass., August 1889, *A. B. Seymour* (Seym. & Earle, Econ. Fungi 54), Isle au Haute, Me., Sept. 6, 1899, *J. C. Arthur,* Central Village, Conn., Aug. 20, 1900, *John L. Sheldon,* Jackson, Ind., July 28, 1905, *C. C. Deam,* Elm Lake, Wis., Sept. 12, 1907, *C. L. Shear,* Winona Lake, Ind., Aug. 26, 1914, *G. N. Hoffer;* on *E. viridi-carinatum* (Engelm.) Fernald, at Avilla, Ind., August, 1884, *W. B. VanGorder,* Oneida, N. Y., June 27, 1915, *H. D. House;* on *Senecio aureus* L., at Buffalo, N. Y., without date, *G. W. Clinton,* Decorah, Iowa, June, 1883, *E. W. D. Holway,* Ann Arbor, Mich., June 8, 1898, *C. H. Kauffman,* Mt. Chocorua, N. H., July 3, 1906, *W. G. Farlow,* Radisson, Wis., July 6, 1906, *J. J. Davis,* Merrimac, Wis., June 19, 1912, *Davis & Arthur,* Oneida, N. Y., June 27, 1915, *H. D. House;* on *S. ductoris* Piper, Mt. Hood, Ore., at 5,000 feet altitude, July 23, 1915, *H. S. Jackson.* It is evident that the rust is widespread in America, especially northward, but not particularly abundant, and the aecia have been collected over nearly the same territory as have the telia.

The morphological differences between *P. angustata* and *P. Eriophori* are very considerable in the aecia, and while less marked in the uredinia and telia are yet noticeable. The urediniospores of *P. Eriophori* are more globoid, while the teliospores are somewhat shorter (35–60 μ long, against 42–67 μ in *P. angustata*) and the apex thinner (4–10 μ, against 7–16 μ in the other) with more tendency to acuteness.

4. PUCCINIA AGROPYRI E. & Ev. (*P. alternans* Arth.)—A collection on *Festuca Thurberi* Vasey, sent from Lake Eldora, Colo., by Mr. E. Bethel, was sown May 13, on *Anemone cylindrica, Aquilegia canadensis, Clematis ligusticifolia,* and *Thalictrum dioicum.* Infection was obtained on the last named host only, which began to show pycnia May 23, and aecia May 30. In sending this material Mr. Bethel wrote that he thought it had been derived in the field from aecia on *Thalictrum Fendleri,* which the culture confirms as highly probable. The first collection of this

kind sent the writer by Mr. Bethel was dated Sept. 17, 1910, and was intended for cultures on *Thalictrum*. This could not be made to germinate when time for culture work arrived, nor could a half dozen other collections sent subsequently at various dates. With a specimen dated April 5, 1912, Mr. Bethel states that he has "proven by most positive field cultures" that it goes to *Thalictrum Fendleri*. Again in May, 1915, Mr. Bethel sent fine material from his garden, showing the telia that had been brought there and the aecia on *Thalictrum* derived therefrom. The reasons for listing the *Thalictrum* form under *P. Agropyri* were stated in the last report.[12] The aecia are especially large and prominent in this particular race on *Festuca*, as shown by a number of collections sent from the same locality.

5. PUCCINIA ASPERIFOLII (Pers.) Wettst.—Two plants of *Anchusa officinalis* L. were given ample space in the experimental garden of the Indiana Experiment Station and attained a fine development, each plant measuring five or six feet across. On July 2, the weather being especially damp with occasional light showers, stems of rye, heavily infested with rust, were laid upon the two plants in the garden, doubtless a hundred or more stems to each plant. The plants were not covered in any manner. The date of the appearance of the first pycnia was not recorded, but on July 13, the plants were conspicuously dotted with yellow spots bearing groups of pycnia. About a week later careful search brought to light two groups of aecia. Although the vigor of the plants and the condition of the weather seemed favorable, and the great numbers of yellow spots with their groups of pycnia continued to show, yet no further development of the rust took place.[13]

The reason why the infection should have started out with such marked vigor and yet failed to mature aecia is not at all apparent. The weather for the whole period was favorable for aecial growth. It is possible, and yet scarcely probable, that the explanation lies in the lessened vigor for the American rye rust, which is propagated by repeating spores alone, the aecial hosts being practically wanting in America.

[12] Mycol. 7: 74. 1915.

[13] For a previous culture of similar character see Mycol. 1: 236. 1909.

6. PUCCINIA SEYMOURIANA Arth. (*Aecidium obesum* Arth.).—This rust on *Spartina* at the time it was described in 1902 was predicted upon morphological and geographical grounds to have its alternate form upon the Rubiaceous genus *Cephalanthus*,[14] the prediction being established by cultures in 1905, and confirmed in subsequent seasons.[15] It was not until June, 1913, that additional suggestions came to light, when Rev. J. M. Bates wrote that his observations in the field led him to believe that in Nebraska this rust on *Spartina* was connected with an *Aecidium* on *Apocynum hypericifolium*. He sent a specimen of the aecia, which proved to be *Aecidium obesum* Arth. This collection was distributed as *4103* of Barth. Fungi Columbiani, and *1301* of Barth. N. Amer. Ured. Later in the year a careful microscopic comparison of these aecia with those on *Cephalanthus* established their essential similarity. Owing to adverse seasonal conditions Mr. Bates was unable to supply culture material for the 1914 cultures, but on May 8, 1915, he sent telial material on *Spartina Michauxiana* from Eight Mile Creek, near Red Cloud, Neb. It was sown May 12, on *Apocynum cannabinum, Amsonia salicifolia, Asclepias syriaca,* and *Cephalanthus occidentalis,* producing a scanty infection only on *Apocynum,* pycnia showing June 10, but without developing aecia.

A specimen of aecia on *Asclepias pulchra,* collected by Mr. Roy Latham, of Orient, N. Y., June 29, 1914, was reported to the collector upon cursory examination only, as aecia of *Puccinia Jamesiana,* that being the only species at that time known to have aecia with a limited mycelium on *Asclepias,* and it was suggested that he search for telial material on *Bouteloua*. Not long afterward he wrote that *Bouteloua* was not known upon Long Island, and that among the infected milkweeds, which occur on "a patch about 100 feet in length by 25 in width, many plants being actually covered from ground up, stem, leaves, and all," the only grass or sedge bearing rust was *Spartina cynosuroides,* of which he sent leaves covered thickly with telia remaining over from the preceding year, and young leaves of the season with uredinia. The *Spartina* rust

[14] Bot. Gaz. 34: 13. 1902.

[15] Jour. Myc. 12: 24. 1906; Mycol. 1: 236. 1909; 4: 19. 1910.

proved to be *P. Seymouriana,* and the aecia on *Asclepias* resembled those belonging to that species. Mr. Latham kindly sent viable material for cultures, collected at the same spot June 2, 1915, which was sown June 10 on plants of the four hosts used in the previous culture. Only *Asclepias syriaca* became infected, showing an abundance of pycnia June 17 and great numbers of aecia June 23.

It may fairly be concluded that this species of rust is one composed of well-marked races in accordance with the aecial hosts. Besides the three races here indicated, another doubtless occurs in connection with *Amsonia,* the characteristic aecia having been found on this host from Missouri.

7. PUCCINIA SUBNITENS Diet.—A collection of this rust on *Distichlis spicata,* very common in alkaline regions, was sent by Prof. H. S. Jackson from LaGrand, Ore., and sown April 15, on *Chenopodium album.* Pycnia began to show April 25, and aecia May 8, chiefly on the petioles of the leaves.[16] Telial material has now been cultured from the states of Nebraska, Colorado, Delaware, Nevada, and Oregon, extending from the Atlantic to the Pacific coasts.

8. PUCCINIA WINDSORIAE Schw.—Much attention has been given to finding the telial host for the aecia on *Dirca palustris,* beginning with the illusory success of 1903 and continuing to the present time.[17] Many telial collections have been used, secured from widely separated localities, and representing many species of rusts. During the last year a search through the herbarium for aecia on other hosts, having similar microscopic characters, led to the possibility that it might be a racial part of the common *Puccinia Windsoriae.* To test this hypothesis telial material was secured near Lafayette, on *Tridens flavus,* from the vicinity of *Dirca* bushes, annually showing the lemon-yellow spots carrying the aecia. Sowings were made May 3, on *Dirca palustris,* May

[16] For previous cultures see Bot. Gaz. **35**: 19. 1903; Jour. Myc. **11**: 54. 1905; **12**: 16. 1906; **13**: 197. 1907; **14**: 15. 1908; Mycol. **1**: 234. 1909; **2**: 225. 1910; and **4**: 18, 54. 1912.

[17] For previous attempts see Jour. Myc. **10**: 19. 1904; **11**: 56. 1905; **13**: 191, 192, 196. 1907; **14**: 12. 1908. Mycol. **1**: 231. 1909; **2**: 219, 227. 1910; **4**: 9, 10, 11, 12. 1912; **7**: 64, 65. 1914.

22, on *Dirca* and *Ptelea trifoliata,* May 24, on *Ptelea.* Only on *Ptelea* was infection secured, abundant pycnia showing from both sowings June 2, and aecia June 7.[18]

SUCCESSFUL CULTURES REPORTED NOW FOR THE FIRST TIME.—The following species have never before been cultivated in America or elsewhere, so far as the writer knows.

1. PUCCINIA TUMIDIPES Peck.—Excellent telial material of this species on *Lycium pallidum,* was sent by Mr. W. A. Archer, collected in the Organ Mountains, N. Mex., on Oct. 9, 1914. As it was found the teliospores would germinate, it was sown Dec. 1, 1914, on plants of *Lycium vulgare,* giving a few pycnia only by Dec. 18, with no further development, possibly owing to the poor condition of the host plant. It was sown again on another plant of the same sort Dec. 12, 1914, giving rise to a few groups of pycnia by Dec. 21, and a single uredineal sorus Jan. 16, 1915.

Although the growth of the fungus was not vigorous, and did not continue to the final stage, yet it seems safe to conclude that the rust is autoecious, and without cupulate aecia. It clearly belongs in the genus *Bullaria,* where it becomes **B. tumidipes** (Peck) comb. nov.

2. PUCCINIA DISTICHLIDIS Ellis & Ev.—This rust in the first place was sent to Mr. Ellis in 1891 by F. D. Kelsey of Helena, Mont., and labeled as on "*Distichlis maritima,*" but afterward was shown by the writer[19] to be on *Spartina gracilis.* On account of this erroneous determination of the host plant, the rust was renamed *P. Kelseyi* by Sydow.[20] In a study of "Correlation between certain species of Puccinia and Uromyces" Orton[21] came to the conclusion from a comparison of the morphological characters and geographical distribution of *Uromyces Spartinae* and the rust in hand, that it was "extremely probable that its aecial host is some member of the primrose family, perhaps *Steironema,*" this being one of the aecial hosts for the *Uromyces.* It has been

[18] For previous successful cultures see Bot. Gaz. **29**: 273. 1900; **35**: 16. 1903; Jour. Myc. **11**: 56. 1905.

[19] Bull. Lab. Nat. Hist. Univ. Iowa **5**: 324. 1902.

[20] Sydow, Monog. Ured. **1**: 806. 1904.

[21] Mycol. **4**: 202. 1912.

difficult to locate this rust in localities from which culture material could be secured. Dr. Brenckle sent material from Kulm, N. Dak., from which cultures were attempted in 1909 and 1910[22] upon a score of different hosts, but not including *Steironema*. Again material on *S. Michauxiana* was obtained from Dr. Brenckle, collected April 8, 1915, at Kulm, N. Dak., and also from Rev. J. M. Bates, collected April 20, 1915, at Loup City, Neb.

The North Dakota material was sown May 8, on *Steironema ciliatum*, and pycnia began to show May 16, followed by an abundance of aecia May 22. The Nebraska material was sown May 8, on *Steironema ciliatum* and *Polemonium reptans*. The *Polemonium* plant remained uninfected, but many pycnia began to show on the *Steironema* May 14, followed by a great abundance of aecia May 20. Although these cultures were exceedingly vigorous and in so far seemed beyond question, yet there exists a possible small source of error. The correlated *Uromyces* is a common rust, and occasionally grows upon the same leaves with the *Puccinia*. In the Nebraska material no admixture could be found, but there were sori of *Uromyces* on the North Dakota material. Care was exercised, however, to avoid all sori with one-celled spores in making the cultures, and as the two forms were mostly on separate leaves, there is little reason to doubt that the cultures were pure. Correctness of the general conclusion was obtained from a wholly independent source, however, when Dr. Brenckle sent a collection of aecia on *Steironema ciliatum*, made by Prof. O. A. Stevens near Fargo, N. Dak., May 23, 1915. On June 5 Dr. Brenckle accompanied Prof. Stevens to the spot where the collection was made, to institute a search for *Spartina*, as Prof. Stevens had reported that the grass did not grow within miles of the place. Dr. Brenckle writes, June 16, that he "found a small isolated bunch of *Spartina* in the midst of the infected spot; the rust on the *Spartina* was *Puccinia!*" The collection of aecia has been issued as Fungi Dakotenses *316*, under the name of *Puccinia Distichlidis*. This is the only field collection of aecia positively known to belong to the *Puccinia* form.

3. PUCCINIA MONTANENSIS Ellis.—There has been much con-

[22] Mycol. 2: 219. 1910; 4: 11. 1912.

fusion in the application of this name. Not until within the present year has it been possible to secure a clearly defined set of characters with which to delimit the species, especially to distinguish it from *Puccinia Agropyri* E. & E., with which it often grows, and which it resembles in gross appearance. It is now found to be separable from *P. Agropyri*, by the slightly thinner-walled urediniospores, having more pores (8 to 10, instead of 6 to 8 in *P. Agropyri*), sometimes accompanied by paraphyses, but more especially by the far broader teliospores (18 to 34 μ wide, against 13–24 μ in the other species), which generally approximate an oblong form with convex sides, in contrast with terete spores usually with straight sides in *P. Agropyri.*

The rust in question has often been labeled *P. apocrypta* E. & T. The type of *P. apocrypta* was collected at Canon City, Colo., August 21, 1887, and was recorded as on *Asprella Hystrix*. The type collection is now in the herbarium of the Missouri Botanical Garden, and has been carefully examined by a number of students of the grasses. The specimen is scanty, and consists of leaves only. It can not be the species of grass named, which does not occur within the region. It seems most likely to be some species of *Sitanion* possibly *S. elymoides,* a common species of the region much resembling *Hystrix*. The rust is certainly *P. Agropyri,* although the teliospores are rather broader than usual. The type material of *P. montanensis,* which is in the herbarium of the New York Botanical Garden, has been examined and bears out the published statement that it is on *Elymus condensatus*. It was collected at Helena, Mont., July 25, 1891, by F. D. Kelsey.

The fortunate observation which led to the elucidation of this species was made by Mr. A. O. Garrett, of Salt Lake City, Utah, who wrote on May 23, 1915: "I am sending by this mail some leaves of *Hydrophyllum* [*capitatum*] heavily infected with *Aecidium Hydrophylli.* I think this rust has the alternate stage on *Agropyron*. I always find the *Agropyron* plant plentiful, and it is affected by the rust, wherever the Hydrophyllums grow." The aecia on *Hydrophyllum* sent by Mr. Garrett came in good condition, and were sown May 28, on *Agropyron tenerum* and *Elymus virginicus*. Uredinia began to show in abundance June 7, on the

Agropyron, followed by telia June 11. On the *Elymus* only a few uredinia developed, not observed until June 23. A study of the uredinia and telia on the *Agropyron* disclosed the characters of *Puccinia montanensis.* Field observations by Dr. Brenckle of North Dakota, Mr. Garrett of Utah, and Mr. Bethel of Colorado, independently reported, associated aecia on *Lithospermum, Onosmodium,* and *Phacelia,* with *Agropyron* and *Elymus* rust, but material sent to establish the connection by cultures failed to yield results. Subsequent herbarium studies leave little chance for doubt that *Puccinia Agropyri* has its alternate form on Ranunculaceous hosts, while *P. montanensis* has its alternate form on Hydrophyllaceous and Borraginaceous hosts.

Two former attempts at culture of *P. montanensis*[23] are shown by a reexamination of the original material to have been made by using *P. Agropyri,* and not *P. montanensis,* as published.

4. UROMYCES HORDEI Tracy.—Telial material on *Hordeum pusillum* Nutt., sent by F. McAllister and B. C. Tharp from Austin, Texas, was sown March 15, on *Nothoscordium striatum* and *Ornithogalum umbellatum,* and again March 30 on the latter host, with infection only on the *Nothoscordium,* showing pycnia March 30, and aecia April 6, both strongly developed.

When the report of culture experiments for the years 1911 to 1913 by W. Tranzschel[24] came to hand, the account of the successful growth of barley rust on *Ornithogalum umbellatum* suggested the renewal of a study of the correlated American species of *Uromyces, U. Hordei* Tracy. There is no morphological difference between the uredinia and telia of the latter species and those of *Puccinia anomala* Rostr. (*P. simplex* Eriks. & Henn.), except that part, rarely all, of the teliospores of the *Puccinia* are two-celled. *Ornithogalum umbellatum* is the Star-of-Bethlehem of the florists, and has escaped from gardens and become a weed in the southern states as far northward as the Ohio river. Aecia on it have not been reported for America, but they are known on a near relative, *Nothoscordium bivalve* (L.) Britton (*Ornithogalum bivalve* L.), from Texas. An appeal to Dr. McAl-

[23] Jour. Myc. 14: 11. 1908; and Mycol. 1: 11. 1912.

[24] Mycol. Centr. 4: 70. 1914.

lister and Mr. Tharp, of the University of Texas, made in November, 1914, soon placed in my possession resting telia on *Hordeum pusillum* and dormant bulbs of the *Nothoscordium,* which were made to yield the above results.

In the meantime it was remembered that Mr. W. H. Long had reported this connection several years before. In a letter dated Feb. 28, 1904, he says: "I have successfully grown *Uromyces Hordei* urediniospores from sowings of aeciospores that I find on *Nothoscordium striatum* [*N. bivalve*]." Again on March 24, 1910, Mr. Long wrote: "Since writing you last I have cross-inoculated teliospores on *Nothoscordium striatum,* and aeciospores from it upon *Hordeum nodosum* [error for *H. pusillum*], and got successful cultures in both instances." Mr. Long kindly sent material to illustrate his work and also material with which to verify his conclusions. Unfortunately it was not possible to bring about conditions for the cultures, and as Mr. Long's work was done in the open, and not verified by others, the results were omitted from the North American Flora when this species was reached.[25]

In this connection it may be well to say that the statement in the North American Flora that the species occurs in California on *Hordeum nodosum* is erroneous. The species ranges from Nebraska to Mississippi and Texas, which also includes the range of the aecial host, although the aecia have only been taken in Texas.

SUMMARY

The following is a complete list of the successful cultures made during the year 1915. It is divided into two series, species that have previously been grown in cultures and reported by the writer or other investigators, and species whose culture is now reported for the first time.

A. SPECIES PREVIOUSLY REPORTED

1. PUCCINIA EXTENSICOLA Plowr. (*P. Dulichii* Syd.).—Teliospores from *Dulichium arundinaceum* (L.) Britt., sown on *Solidago canadensis* L.

25 N. Amer. Flora 7: 228. 1912.

2. PUCCINIA GROSSULARIAE (Schum.) Lagerh. (*P. uniporula* Orton).—Teliospores from *Carex tenuis* Rudge, and from *C. arctata* Boott, sown on *Ribes Cynosbati* L.

3. PUCCINIA ERIOPHORI Thüm.—Aeciospores from *Senecio aureus* L., sown on *Eriophorum viridi-carinatum* (Engelm.) Fernald.

4. PUCCINIA AGROPYRI Ellis & Ev. (*P. alternans* Arth.).—Teliospores from *Festuca Thurberi* Vasey, sown on *Thalictrum dioicum* L.

5. PUCCINIA ASPERIFOLII (Pers.) Wettst.—Teliospores from *Secale cereale* L., sown on *Anchusa officinalis* L.

6. PUCCINIA SEYMOURIANA Arth. (*Aecidium obesum* Arth.).—Teliospores from *Spartina Michauxiana* Hitchc., sown on *Apocynum cannabinum* L., and from *Spartina cynosuroides* (L.) Roth, sown on *Asclepias syriaca* L.

7. PUCCINIA SUBNITENS Diet.—Teliospores from *Distichlis spicata* (L.) Greene, sown on *Chenopodium album* L.

8. PUCCINIA WINDSORIAE Schw.—Teliospores from *Tridens flavus* (L.) Hitchc. (*Tricuspis seslerioides* Torr.), sown on *Ptelea trifoliata* L.

B. SPECIES REPORTED NOW FOR THE FIRST TIME

1. PUCCINIA TUMIDIPES Peck.—Teliospores from *Lycium pallidum* Miers, sown on *L. vulgare* Dunal, producing pycnia and uredinia.

2. PUCCINIA DISTICHLIDIS Ellis & Ev.—Teliospores from *Spartina Michauxiana* Hitchc., sown on *Steironema ciliatum* (L.) Raf.

3. PUCCINIA MONTANENSIS Ellis (*Aecidium Hydrophylli* Peck).—Aeciospores from *Hydrophyllum capitatum* Dougl., sown on *Agropyron tenerum* Vasey and *Elymus virginicus* L.

4. UROMYCES HORDEI Tracy.—Teliospores from *Hordeum pusillum* Nutt., sown on *Nothoscordium bivalve* (L.) Britton.

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FUNGI OF NEW MEXICO[1]

Paul C. Standley

The flowering plants and vascular cryptogams of New Mexico are now fairly well known and much has been published concerning them. The collections upon which our knowledge is based were begun as early as 1820, and some of the larger and more important ones were made from 1846 to the middle fifties, although most of our knowledge of the plants of the state results from the extensive collections obtained in the last twenty-five years.

Concerning the lower cryptogams of New Mexico, however, only the most fragmentary information is available. The early collectors paid little attention to any but the higher plants. August Fendler (1846–47) and Charles Wright (1851–52) gathered a few mosses and hepatics, but even the most recent collectors have taken little interest in those groups or in the lichens and fungi. Dr. T. H. Macbride spent one season in New Mexico collecting Myxomycetes and published[2] a list of 25 species which he obtained. Prof. T. D. A. Cockerell, ever an untiring student of matters pertaining to the natural history of the state, has collected many specimens of cryptogams, and has published[3] the only list of New Mexican fungi (46 species) which has thus far appeared. Several mycologists—S. M. Tracy, F. S. Earle, David Griffiths, G. G. Hedgcock, E. W. D. Holway, and perhaps others—have collected in New Mexico. In the spring of 1914 Dr. J. C. Arthur and Dr. F. D. Fromme visited the state for the purpose of securing material for their investigations of the Uredinales. But the only results from these explorations, so far as the literature of New Mexican mycology is concerned, have been scattered descriptions of new species or incidental references in various monographs.

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Proc. Iowa Acad. Sci. 12: 33–38. 1905.

[3] Jour. Myc. 10: 49–51. 1904.

Although the present writer's chief interest has always been in the phanerogamic flora of New Mexico, soon after the beginning of his studies in the state (in 1909) he began to collect such of the lower cryptogams as he happened upon. It is to be regretted that more attention was not devoted to them and much larger collections obtained, as might easily have been done especially in the southern part of the state. During three different years, however, the writer has spent some time in searching especially for parasitic fungi: in 1908 in the Santa Fe and Las Vegas mountains; in 1911 in Rio Arriba and San Juan counties; and in 1914 in the vicinity of Brazos Canyon, Rio Arriba County. The present paper is based chiefly upon the collections thus obtained. There are also included references to many specimens obtained by Mr. E. O. Wooton. Prof. Cockerell has very kindly furnished a manuscript list of species of his collection not included in his published list, while Dr. Arthur has made available material which permits the inclusion of several species, as well as specimens showing more extended distribution. Reference is made also to such reliable data as have been found in literature, but no doubt some published records have been overlooked.

Not being a mycologist, the writer has been obliged to turn to others for the identifications of his collections and he takes pleasure in acknowledging the generous interest and pains taken by those who have named the material. Dr. J. C. Arthur has furnished the identifications of the Uredinales; Dr. G. P. Clinton those of the Ustilaginales; Dr. W. A. Murrill the Agaricales and Lycoperdales; and Dr. C. E. Fairman, Dr. David R. Sumstine, and Prof. Guy West Wilson those of the other groups. Special thanks are due Dr. Arthur upon whom fell the task of naming the larger part of the specimens. Dr. Arthur has also furnished supplementary material and data and has revised the manuscript of the Uredinales.

Although the chief part of the present list consists of the Uredinales and Ustilaginales, it seems worth while to publish the lists of other groups, although they are evidently only fragmentary. It is greatly to be desired that in the near future an adequate study

may be made of the Agaricales and Lycoperdales, of which the New Mexico mountains will doubtless furnish many species.

CHYTRIDALES

SYNCHYTRIUM FULGENS Schröt.

On *Anogra coronopifolia* (T. & G.) Britton: Dulce, Aug. 19, 1911, *Standley 8106*. Determined by Sumstine.

PERONOSPORALES

(Determined by Prof. Guy West Wilson, unless stated otherwise)

ALBUGO BLITI (Biv.) Kuntze

On *Amaranthus Powellii* S. Wats. (a new host): Plains 35 miles south of Torrance, Aug. 10, 1909, *Wooton* (determined by Sumstine); Pecos, Aug. 22, 1908, *Standley 5191;* Cedar Hill, Aug. 15, 1911, *Standley 7900*. On *Amaranthus blitoides* S. Wats.: Torrance, Aug. 11, 1909, *Wooton.*

ALBUGO CANDIDA (Pers.) Roussel

On *Sophia incisa* (Engelm.) Greene: Filmore Canyon, Sept. 20, 1908, *Standley;* Winsor Creek, July 13, 1908, *Standley 4340.* On *Cheirinia* sp.: Range Reserve, Dona Ana Co., May 14, 1913, *Wooton;* San Andreas Mts., October, 1914, *Wooton.*

ALBUGO FROELICHIAE G. W. Wilson

Reported from New Mexico, on *Cladothrix lanuginosa* Nutt. (*Tidestromia lanuginosa* (Nutt.) Standley[4]) by Wilson.[5]

ALBUGO IPOMOEAE-PANDURATAE (Schw.) Swingle

On *Ipomoea hirsutula* Jacq.: Round Mt., above Tularosa, July 22, 1897, *Wooton.*

[4] Jour. Wash. Acad. 6: 70. 1916.

[5] Bull. Torrey Club 35: 362. 1908.

ALBUGO TRIANTHEMAE G. W. Wilson

On *Trianthema Portulacastrum* L.: Mesilla Valley, August, 1908, *Standley.*

The type was collected near Las Cruces by Wooton. The species is known only from the Mesilla Valley.

PERONOSPORA LEPIDII (McAlp.) G. W. Wilson

On *Sophia incisa* (Engelm.) Greene (a new host): Placitas, Aug. 3, 1910, *Wooton.*

PERONOSPORA PARASITICA (Pers.) Fries

On *Sophia incisa* (Engelm.) Greene: Beatty's Cabin, Aug. 8, 1908, *Standley 4842.* On *Sophia ochroleuca* Wooton (a new host): Mesilla Valley, 1908, *Standley 3886.*

PHYSOTHECA HALSTEDII (Farl.) G. W. Wilson

On *Ximenesia exauriculata* (Rob. & Greenm.) Rydb.: Pecos, Aug. 21, 1908, *Standley 5154;* Raton, June 22, 1911, *Standley 6309.*

PHYTOPHTHORA INFESTANS (Mont.) De Bary?

On *Solanum tuberosum* L. (cultivated): White Mts., Aug. 15, 1908, *Wooton.* Determined by Sumstine.

SPHAERIALES

(Erysiphaceae determined by Prof. Guy West Wilson, the others by Dr. C. E. Fairman, unless stated otherwise)

ASTERINA MEXICANA Ellis & Ev.

On *Agave neomexicana* Woot. & Standl.: Queen, July 31, 1909, *Wooton.* "Perithecia surrounded at base by mycelial threads. Asci abruptly stipitate, $60 \times 17–20\,\mu$; or saccate or globose; about $25–30\,\mu$ in diam. Sporidia: upper cell smaller and globose; lower cell longer and oblong, $24–30 \times 10–12\,\mu$. This was orig-

inally collected in Mexico, and I do not know whether it has been found in the States previously to the discovery of this specimen or not." (Fairman.)

AUERSWALDIA PRINGLEI (Peck) Sacc.

On leaves of *Yucca macrocarpa* (Engelm.) Coville: Mesa west of Organ Mts., September, 1908, *Standley*. "Sporidia uniseriate, hyaline then yellowish brown, oblong-elliptical, rounded at ends, $27–33 \times 12–14 \mu$." (Fairman.)

CLAVICEPS PURPUREA Fr.

On *Agropyron Smithii* Rydb.: Near Ensenada, Sept. 10, 1914, *Standley & Bollman 11232*. On *Elymus canadensis* L.: Pecos, Aug. 25, 1908, *Standley 5319*.

DIMEROSPORIUM COLLINSII (Schw.) Thüm.

On *Amelanchier oreophila* A. Nels.: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10681*. On *Amelanchier polycarpa* Greene: Chama, July 9, 1911, *Standley 6618*.

ERYSIPHE CICHORACEARUM DC.

On *Lactuca integrata* (Gren. & Godr.) A. Nels.: Farmington, July 20, 1911, *Standley 7150*. (? Immature.) On *Heliopsis scabra* Dunal: Gilmore's Ranch, Aug. 15, 1897, *Wooton*. On *Madia glomerata* Hook.: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10972*. On *Chrysothamnus linifolius* Greene (a new host): Shiprock, Aug. 12, 1911, *Standley 7890*. On *Chrysothamnus Vaseyi* (A. Gray) Greene (a new host): Stinking Lake, Aug. 21, 1911, *Standley 8252*. On *Aster vallicola* Greene (a new host): Santa Fe, July 23, 1908, *Standley 4516*. On *Erigeron subtrinervis* Rydb. (a new host): Brazos Canyon, Sept. 6, 1914, *Standley & Bollman 11168*. On *Iva xanthiifolia* Nutt.: Pecos, Aug. 20, 1908, *Standley 5141*. On *Artemisia dracunculoides* Pursh (a new host): Winsor's Ranch, Aug. 12, 1908, *Standley 4894*. On *Hydrophyllum Fendleri* (A. Gray) Heller (a new host): Winsor Creek, July 5, 1908, *Standley 4199*; Chama, July

9, 1911, *Standley 6629;* (? Conidia) Brazos Canyon, Sept. 8, 1914, *Standley & Bollman 11200.* On *Mertensia pratensis* Heller (a new host): Chama, July 9, 1911, *Standley 6724.* On *Mertensia* sp.: Brazos Canyon, Aug. 25, 1914, *Standley & Bollman 10797.* (?) On *Phacelia heterophylla* Pursh: Beatty's Cabin, Aug. 8, 1908, *Standley 4855.*

Reported by Cockerell from Pecos on *Verbena Macdougalii* Heller.

ERYSIPHE GALEOPSIDIS DC.

On *Stachys scopulorum* Greene (a new host): Pecos, Aug. 22, 1908, *Standley 5196.*

ERYSIPHE GRAMINIS DC.

On *Poa pratensis* L.: Pecos, Aug. 22, 1908, *Standley 5173.*

ERYSIPHE POLYGONI DC.

On *Polygonum buxiforme* Small (a new host): (? Conidia) Pecos, Aug. 19, 1908, *Standley 5106;* Agricultural College, June 28, 1911, *Standley 6388;* Placitas, Aug. 3, 1910, *Wooton;* Farmington, July 18, 1911, *Standley 7061.* On *Polygonum ramosissimum* Michx.: Pecos, Aug. 15, 1908, *Standley 5003.* On *Pisum sativum* L.: Pecos, Aug. 22, 1908, *Standley 5182.* On *Glycyrrhiza lepidota* Nutt.: Pecos, Aug. 20, 1908, *Standley 5142.* On *Lathyrus leucanthus* Rydb. (a new host): Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10927.*

ERYSIPHE sp.

On *Polemonium molle* Greene: Placitas, Aug. 3, 1910, *Wooton.* Regarding this collection Prof. Wilson furnished the following note. "While *E. Cichoracearum* would be expected as the most probable species on this host, the present collection does not belong to that species, but appears to be undescribed. As the ascospores are very immature it does not seem wise to describe the form as new without further material."

Besides the specimens of Erysiphaceae listed above, several packets examined by Prof. Wilson contained nothing but the

Oidium stage. These are listed here with Prof. Wilson's suggestions as to the possible perithecial form. Since the present knowledge of the Erysiphaceae is not sufficient to warrant specific determinations of the relationships of Oidia, and the perithecia might prove the suggestions incorrect, the present determinations are, of course, only tentative.

Erysiphe Polygoni?. On *Oenothera procera* Wooton & Standley: Ponchuelo Creek, July 28, 1908, *Standley 4585.* On *Pisum sativum* L.: White Mts., Aug. 15, 1908, *Wooton.*

Erysiphe Cichoracearum?. On *Grindelia aphanactis* Rydb.: Dulce, Aug. 19, 1911, *Standley 8081.* On *Verbena Macdougalii* Heller: Pecos, Aug. 22, 1908, *Standley 5194.*

Uncertain. On *Dugaldea Hoopesii* (A. Gray) Rydb.: Chama, July 10, 1911, *Standley 6759.* On *Humulus Lupulus neomexicanus* Nels. & Cockerell: Pecos, Aug. 25, 1908, *Standley 5307.* On *Ximenesia exauriculata* (Rob. & Greenm.) Rydb.: Mesilla Valley, Oct. 15, 1905, *Wooton.*

MICROSPHAERA SYMPHORICARPI E. C. Howe

On *Symphoricarpos rotundifolius* A. Gray: Gilmore's Ranch, Aug. 14, 1897, *Wooton.*

OHLERIELLA NEOMEXICANA Earle

The type was collected by Cockerell, Nov. 29, 1901, on "old whitened woody stems," at Albuquerque.

PHYLLACHORA DASYLIRII Peck

Reported by Cockerell from Soledad Canyon, Organ Mts., on *Dasylirion Wheeleri* S. Wats.

PHYLLACHORA GRAMINIS (Pers.) Fuckel

On *Muhlenbergia neomexicana* Vasey: San Andreas Mts., Oct. 6, 1912, *Wooton.*

PHYLLACHORA TRIFOLII (Pers.) Fuckel

On *Trifolium repens* L.: Pecos, Aug. 25, 1908, *Standley 5291.* On *Trifolium Fendleri* Greene: Pecos, Aug. 19, 1908, *Standley*

5102. On *Trifolium Rydbergii* Greene: Costilla Valley, Sept. 5, 1913, *Wooton.*

PHYSALOSPORA AURANTIA Ellis & Ev.

On *Helianthus fascicularis* Greene: Pecos, Aug. 25, 1908, *Standley.* Determined by Sumstine.

PLOWRIGHTIA MORBOSA (Schw.) Sacc.

This is abundant on *Padus melanocarpa* (A. Nels.) Shafer, wherever that species grows. I do not remember having seen it on any of the other species of *Padus* but probably it occurs on them also.

PLOWRIGHTIA NEOMEXICANA Earle

The type was collected by Cockerell, July, 1902, between San Ignacio and Las Vegas, on dead, withered stems of "*Ampelopsis quinquefolia* (?)" (*Parthenocissus vitacea* (Knerr) Hitchc.).

PODOSPHAERA OXYCANTHAE (DC.) De Bary

On *Padus melanocarpa* (A. Nels.) Shafer: Placitas, Aug. 3, 1910, *Wooton.*

UNCINULA NECATOR (Schwein.) Burr.

Reported from New Mexico by Salmon (Mem. Torrey Club 9: 100. 1900).

UNCINULA POLYCHAETA (Berk. & Curt.) Ellis & Ev.

On *Celtis reticulata* Torr.: Filmore Canyon, Organ Mts., Sept. 20, 1908, *Standley.* Dr. Fairman states that this is a new host for this beautiful parasite. It is very common upon the hackberry trees in the Organ Mountains.

VENTURIA DICKIEI (B. & Br.) Ces. & De N.

On *Linnaea americana* Forbes: Horsethief Canyon, Pecos National Forest, Aug. 11, 1908, *Standley 4884.* Ellis and Everhart report this only from New Hampshire and New York. *Linnaea* is known in New Mexico only from the collection cited.

PEZIZALES

PEZIZA REGALIS C. & E.

Mesilla, on an apple tree (*Cockerell*). Determination by Earle.

PSEUDOPEZIZA MEDICAGINIS (Lib.) Sacc.

On *Medicago sativa* L.: Pecos, August, 1908, *Standley 8056*. Determined by Sumstine. Reported also from Roswell by Cockerell.

UREDINALES

AECIDIUM ABRONIAE Ellis & Ev.

On leaves of *Allionia melanotricha* Standley: White Mts., 1897, *Wooton*.

AECIDIUM ALLENII Clinton

On *Lepargyrea canadensis* (L.) Greene: Beulah, July, 1902, *Cockerell*.

Aecidium Cockerellii Arthur, sp. nov.

O. Pycnia unknown.

I. Aecia hypophyllous, in circular groups 1.5 mm. across, cupulate, round when free, ellipsoid when crowded sufficiently, 0.1 to 0.3 mm. in diameter; peridium pale, margin erect, erose; peridial cells rhomboidal, slightly longer than broad, 19–21 by 24–27 μ, overlapping somewhat, outer wall 7–10 μ thick, smooth, inner wall 1.5–2.5 μ thick, closely and finely verrucose; aeciospores angularly ellipsoid, oblong, or globoid, 15–18 by 18–23 μ; wall pale yellow to colorless, 1.5 μ thick, occasionally thickened to 2 μ at angles, closely and very finely verrucose, appearing almost smooth when wet.

On Solanaceae: *Chamaesaracha Coronopus* (Dunal) A. Gray, near Las Vegas, New Mexico, 1899, *T. D. A. Cockerell*.

AECIDIUM COMPOSITARUM Auct.

On leaves of *Dugaldea Hoopesii* (A. Gray) Rydb.: Cloudcroft, July 19, 1899, *Wooton;* Rio Pueblo, Aug. 11, 1910, *Wooton;* Winsor Creek, July 28, 1908, *Standley 4581*.

AECIDIUM EUPHORBIAE Am. Auct.

On *Tithymalus Chamaesula* (Boiss.) Woot. & Standl.: Pine Cienaga, southwest of the Mogollon Mts., July 17, 1900, *Wooton*. On leaves of *Tithymalus luridus* (Engelm.) Woot. & Standl.: Tunitcha Mts., Aug. 8, 1911, *Standley 7639*.

AECIDIUM EUROTIAE Ellis & Ev.

On *Eurotia lanata* (Pursh) Moq.: Organ, Sept. 28, 1896, *Cockerell* (*Arthur* in litt.).

AECIDIUM PHYSALIDIS Burr.

On leaves and stems of *Physalis comata* Rydb.: Sierra Grande, June 19, 1911, *Standley 6201*.

ARGOMYCES (?) OXALIDIS (Lév.) Arthur

On leaves of *Ionoxalis violacea* (L.) Small: Placitas, Aug. 3, 1910, *Wooton*.

CALLIOSPORA PETALOSTEMONIS Arthur

The type, on *Petalostemum oligophyllum* (Torr.) Rydb., was collected at Pecos in 1903 by Cockerell.

COLEOSPORIUM RIBICOLA (C. & E.) Arthur

On leaves of *Grossularia leptantha* (A. Gray) Cov. & Britt.: Placitas, Aug. 3, 1910, *Wooton;* Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10864*. On leaves of *Ribes Wolfii* Rothr.: Brazos Canyon, Aug. 26, 1914, *Standley & Bollman 10833*.

CRONARTIUM COLEOSPORIOIDES (Diet. & Holw.) Arthur

On leaves of *Castilleja linariaefolia* Benth.: Dulce, Aug. 19, 1911, *Standley 8109;* Tunitcha Mts., Aug. 8, 1911, *Standley 7823*. On *Castilleja integra* A. Gray: Tunitcha Mts., Aug. 8, 1911, *Standley 7825*. On leaves of *Castilleja confusa* Greene: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10984*. On leaves and stems of *Castilleja sulphurescens* Rydb.: Brazos Canyon, Sept. 1, 1914, *Standley & Bollman 11027*.

CRONARTIUM COMANDRAE Peck

On leaves and stems of *Comandra pallida* A. DC.: Tunitcha Mts., Aug. 8, 1911, *Standley 7764;* Brazos Canyon, Sept. 10, 1914, *Standley & Bollman 11239.*

EARLEA SPECIOSA (Fries) Arthur

(*Phragmidium speciosum* Fries)

On *Rosa pecosensis* in New Mexico, according to Arthur (N. Am. Fl. 7: 176. 1912). Another New Mexican plant on which this occurs in Colorado is *Rosa Fendleri.*

ERIOSPORANGIUM PUNCTATO-STRIATUM (Diet. & Neger) Arthur

On *Baccharis glutinosa* Pers.: Mesilla, June 1897, *Cockerell.*

GYMNOSPORANGIUM GRACILENS (Peck) Kern & Beth.

I. On leaves of *Fendlera rupicola* Engelm. & Gray: Organ Mts., Sept. 28, 1902, *Wooton.* On leaves and fruit of *Fendlera falcata* Thornber: Tunitcha Mts., August, 1911, *Standley.* On *Philadelphus microphyllus* A. Gray: Rito de los Frijoles, August, 1912, *Cockerell.* On *Philadelphus ellipticus* Rydb. (=*P. argyrocalyx* Wooton) in New Mexico, according to Kern (N. Am. Fl. 7: 201. 1912).

III. On *Juniperus monosperma* (Engelm.) Sarg.: Near Placitas, June 29, 1908, *Hedgcock.* On *Juniperus pachyphloea* Torr. in New Mexico, according to Kern (l. c.).

GYMNOSPORANGIUM INCONSPICUUM Kern

I. On *Amelanchier Bakeri* Greene: Bear Mountain, Sept. 1, 1903, *Metcalf.*

The telial stage is reported from Colorado upon *Juniperus utahensis,* a species common in northwestern New Mexico.

GYMNOSPORANGIUM JUVENESCENS Kern

I. On leaves of *Amelanchier mormonica* Schneid.: Dulce, Aug. 20, 1911, *Standley 8205.*

The telial stage occurs in Colorado on *Juniperus scopulorum* Sarg., a common New Mexican species.

GYMNOSPORANGIUM NELSONI Arthur

I. On leaves of *Amelanchier oreophila* A. Nels.: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10663.*

III. On *Juniperus scopulorum* Sarg.: Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10899.* Reported from Colorado also upon *J. utahensis* and *J. monosperma,* common new Mexican species.

HYALOPSORA CHEILANTHIS (Peck) Arthur

On *Notholaena sinuata* Kaulf.: Dark Canyon, Guadalupe Mts., Aug. 5, 1909, *Wooton.* This species is known upon four other ferns, *Ceropteris triangularis, Cheilanthes Pringlei, Cryptogamme Stelleri,* and *Pellaea andromedaefolia,* none of which occurs in New Mexico. Apparently it has not been reported before upon a *Notholaena.*

MELAMPSORA ALBERTENSIS Arthur

On leaves of *Populus aurea* Tidestrom: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10627.* Reported by Arthur in the *North American Flora* only from Alberta.

MELAMPSORA ARCTICA Rostr.

On leaves of *Salix Bebbiana* Sarg.: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10630, 10631;* a new host. On *Salix Wrightii* Anderss.: Mesquite, Aug. 15, 1914, *W. A. Archer.*

MELAMPSORA BIGELOVII Thüm.

On leaves of *Salix amygdaloides* Anderss.: Shiprock, Aug. 11, 1911, *Standley 7866.* On leaves of *Salix Wrightii* Anderss.: Mesilla Valley, Nov. 15, 1903, *Wooton;* a new host. On leaves of *Salix Bebbiana* Sarg.: Pecos, August, 1908, *Standley;* Ponchuelo Creek, July 30, 1908, *Standley 4590.* On leaves of *Salix* spp.: Tunitcha Mts., Aug. 8, 1911, *Standley 7713;* Farmington, July 22, 1911, *Standley 7161.* Reported by Arthur from other

states upon *Salix exigua, S. Fendleriana, S. irrorata, S. lasiandra, S. nigra, S. petrophila,* and *S. Watsoni,* all of which occur in New Mexico.

MELAMPSORA LINI (Schum.) Desmaz.

On leaves of *Linum Lewisii* Pursh: Chama, July 13, 1911, *Standley 6830.*

MELAMPSORA MEDUSAE Thüm.

On *Populus Wislizeni* (S. Wats.) Sarg.: Agricultural College, Sept. 22, 1914, *W. A. Archer.*

MELAMPSORELLA ELATINA (Alb. & Schw.) Arthur

Reported by Hedgcock as occurring in New Mexico (Mycologia 4: 145. 1912).

MELAMPSOROPSIS PYROLAE (DC.) Arthur

On leaves of *Pyrola asarifolia* Michx.: Winsor Creek, June 29, 1908, *Standley 4028.* On leaves of *Pyrola secunda* L.: Winsor Creek, June 29, 1908, *Standley 4029;* Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10976.* Reported upon *Moneses uniflora, Pyrola chlorantha,* and *P. elliptica,* all of which are found in New Mexico.

NYSSOPSORA ECHINATA (Lév.) Arthur

On *Ligusticum Porteri* Coult. & Rose: Sandia Mts., August, 1903, *Hedgcock 107.*

PERIDERMIUM COLORADENSE (Diet.) Arthur & Kern

On leaves of *Picea Parryana* (Andr.) A. Gray: Winsor Creek, July 28, 1908, *Standley 4751;* Rio Pueblo, Aug. 10, 1910, *Wooton.*

PERIDERMIUM EPHEDRAE Cooke[6]

On stems of *Ephedra trifurca* Torr.: Mesa west of Organ Mts., Sept. 28, 1902, *Wooton 3716;* mesa near Las Cruces, July 5, 1897,

[6] See Paul C. Standley, A witch's broom of the desert, Plant World 13: 61–63. 1909.

Wooton 542. On stems of *Ephedra Torreyana* S. Wats.: Buchanan, Aug. 12, 1909, *Wooton.* This rust is extremely common upon *Ephedra trifurca* in southern New Mexico. Because of its large size and bright orange color it is very conspicuous. Dr. Arthur states that no clue to the telial host has yet been obtained.

PHRAGMIDIUM IMITANS Arthur

On leaves of *Rubus arizonicus* (Greene) Rydb.: Cloudcroft, Aug. 8, 1899, *Wooton;* Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10999.*

PHRAGMIDIUM MONTIVAGUM Arthur

On leaves of *Rosa Fendleri* Crép.: Pecos National Forest, 1908, *Standley.* On leaves of *Rosa* sp.: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10638.* To be expected in New Mexico on *Rosa Maximiliani,* upon which it has been found in Colorado.

PHRAGMIDIUM OCCIDENTALE Arthur

On leaves of *Rubacer parviflorum* (Nutt.) Rydb.: Winsor's Ranch, July 4, 1908, *Standley 4178;* Carrizo Mts., August, 1911, *Standley 7738a.*

PHRAGMIDIUM PECKIANUM Arthur

On leaves of *Oreobatus deliciosus* (James) Rydb.: Sierra Grande, June 19, 1911, *Standley 6203.* This is the only New Mexican locality known for this *Oreobatus. Phragmidium Peckianum* is reported by Arthur from New Mexico also upon *Oreobatus neomexicanus* (A. Gray) Rydb. (N. Am. Fl. 7: 165. 1912).

PHRAGMIDIUM POTENTILLAE (Pers.) Karst.

On leaves of *Potentilla strigosa* Pall.: Ensenada, Sept. 10, 1914, *Standley & Bollman 11227.* The species is reported (from Maine) upon *Potentilla monspeliensis,* a species common in New Mexico.

PILEOLARIA PATZCUARENSIS (Holway) Arthur

On *Schmaltzia Emoryi* Greene in New Mexico according to Arthur (N. Am. Fl. 7: 149. 1912). The only other locality known for the species is in Michoacán, Mexico, where it occurs upon *S. schmidelioides* (Schlecht.) Greene.

POLYTHELIS THALICTRI (Chev.) Arthur

On leaves of *Thalictrum Fendleri* Engelm.: Tunitcha Mts., Aug. 8, 1911, *Standley 7744;* Chama, July 13, 1911, *Standley 6826.*

PUCCINIA ABSINTHII DC.

On *Artemisia redolens* A. Gray: Cloudcroft, Sept. 17, 1903, *E. W. D. Holway* (*Bartholomew 767*). On leaves and stems of *Artemisia silvicola* Osterh.: Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10844.*

PUCCINIA ARISTIDAE Tracy

On leaves of *Aristida bromoides* H. B. K.: San Andreas Mts., Oct. 8, 1914, *Wooton.*

PUCCINIA ARTEMISIAE DC.

On leaves and stems of *Artemisia tridentata* Nutt.: Dulce, Aug. 19, 1911, *Standley 8065;* Cedar Hill, Aug. 15, 1911, *Standley 7903.* On leaves of *Artemisia nova* A. Nels.: Dulce, Aug. 19, 1911, *Standley 8100.* On leaves of *Artemisia cana* Pursh: Dulce, Aug. 19, 1911, *Standley 8083.*

PUCCINIA ASPARAGI DC.

III. On *Asparagus officinalis* L.: Mesilla, Dec. 28, 1915, *W. A. Archer 20.*

PUCCINIA ATRO-FUSCA (Dudley) Holway

On leaves of *Carex Douglasii* Boott: Winsor's Ranch, June 20, 1908, *Standley 4095.*

PUCCINIA CANALICULATA (Schw.) Lagerh.

On leaves of *Cyperus esculentus* L.: Mesilla Valley, Oct. 11, 1904, *Wooton.*

PUCCINIA CIRSII Lasch

On leaves of *Cirsium pallidum* Woot. & Standl.: Brazos Canyon, Sept. 2, 1914, *Standley & Bollman 11057.* On *Cirsium undulatum* (Nutt.) Spreng.: Sandia Mts., June 2, 1914, *Miss C. C. Ellis.* On leaves of *Cirsium Wrightii* A. Gray (?): Cloudcroft, Sept. 16, 1903, *E. W. D. Holway* (*Bartholomew, N. Am. Ured. 131*) (II, III).

PUCCINIA CLEMATIDIS (DC.) Lagerh.

[*Puccinia Delphinii* Diet. & Holw.; *Puccinia Agropyri* Ellis & Ev.; *Puccinia alternans* Arthur; *Puccinia obliterata* Arthur.]

I. On leaves, stems, and sepals of *Clematis ligusticifolia* Nutt.: Fresnal, Aug. 6, 1899, *Wooton;* Pecos, Aug. 25, 1908, *Standley;* Placitas, Aug. 3, 1910, *Wooton;* Tunitcha Mts., Aug. 8, 1911, *Standley 7770;* Farmington, July 17, 1911, *Standley 6893.* On leaves of *Thalictrum Fendleri* Engelm.: Winsor's Ranch, June 29, 1908, *Standley 4007;* Chama, July 13, 1911, *Standley 6829;* Beulah, July 10, 1902, *Cockerell.* On *Halerpestes Cymbalaria* (Pursh) Greene: Las Vegas, June 7, 1902, *Cockerell 45.* On *Aquilegia caerulea* James: Beulah, June 29, 1909, *W. P. Cockerell.*

On leaves of *Elymus canadensis* L.: Agricultural College, June 28, 1911, *Standley 6383.* On *Delphinium Sapellonis* Cockerell: Sapello Canyon, *Cockerell.*

PUCCINIA CRESSAE (DC.) Lagerh.

On leaves of *Cressa truxillensis* H. B. K.: Mesilla Valley, Sept. 25, 1907, *Standley;* June, 1896, *Wooton.*

PUCCINIA CRYPTANDRI Ellis & Barth.

On *Sporobolus cryptandrus* (Torr.) A. Gray: Mesilla, Oct. 7, 1915, *W. A. Archer 6;* Las Vegas Hot Springs (*Cockerell*).

PUCCINIA ELLISIANA Thüm.

I. On leaves of *Viola pedatifida* Don: Sierra Grande, June 20, 1911, *Standley 6226*.

PUCCINIA EPILOBII-TETRAGONI (DC.) Wint.

On stems of *Epilobium adenocladon* (Hausskn.) Rydb.: Brazos Canyon, Sept. 2, 1914, *Standley & Bollman 11055*.

PUCCINIA EXTENSICOLA Plowr.

[*P. Caricis-Asteris* Arthur; *P. Caricis-Solidaginis* Arthur.]

I. On leaves of *Solidago Pitcheri* Nutt.: Winter Folly, Aug. 13, 1899, *Wooton*. On leaves of *Aster laevis* L.: Winsor's Ranch, July 4, 1908, *Standley 4180;* Chama, July 14, 1911, *Standley 6838*.

PUCCINIA GAYOPHYTI (Billings) Peck

On stems of *Gayophytum ramosissinum* Torr. & Gray: Dulce, Aug. 19, 1911, *Standley 8073*.

PUCCINIA GRINDELIAE Peck

On stems and involucral bracts of *Gutierrezia tenuis* Greene: Mesa west of Organ Mts., September, 1908, *Wooton & Standley 3863*. On stems and leaves of *Gutierrezia* sp.: Cactus Flat, July 5, 1906, *Wooton*. On *Grindelia* sp.: Santa Fe, 1898, Cockerell. On leaves of *Grindelia aphanactis* Rydb.: Nara Visa, Oct. 2, 1907, *W. Belknap;* Santa Fe, Oct. 1, 1907, *A. Boyle*. On leaves of *Grindelia subalpina* Greene: Raton, June 22, 1911, *Standley 6327*.

PUCCINIA GROSSULARIAE (Pers.) Lagerh.

I. On leaves of *Grossularia leptantha* (A. Gray) Cov. & Britt.: Chama, July 9, 1911, *Standley 6644;* Winsor's Ranch, July 3, 1908, *Standley 4168*.

PUCCINIA HELIANTHI Schw.

On leaves of *Helianthus annuus* L.: Mesilla Valley, August, and Sept. 4, 1908, *Standley;* Agricultural College, June 28, 1911,

Standley 6392; Tunitcha Mts., Aug. 8, 1911, *Standley 7790;* Farmington, July 22, 1911, *Standley 7175.* On *Helianthus ciliaris* DC.: Mesilla, *Cockerell;* Mesilla Park, May 9, 1915, *W. A. Archer* (I); Las Cruces, Oct. 27, 1892, *Wooton;* Albuquerque, December, 1914, *W. A. Long 5183;* Brazito, June 15, 1915, *Archer* (I, II, III).

PUCCINIA HEMISPHERICA Peck

On leaves and stems of *Lactuca pulchella* (Pursh) DC.: Raton, June 21, 1911, *Standley 6301* (O, I); Cedar Hill, Aug. 17, 1911, *Standley 8057* (III).

PUCCINIA INTERMIXTA Peck

I. On leaves of *Iva axillaris* Pursh: Las Vegas, June 2, 1900, *T. A. Williams.*

PUCCINIA JAMESIANA (Peck) Arthur

On *Asclepias galioides* H. B. K.: Gray, July, 1900, *Skehan.* On leaves of *Asclepias brachystephana* Engelm. (I): Redlands, Aug. 17, 1909, *Wooton.* On leaves of *Asclepias latifolia* (Torr.) Raf. (I): Redlands, Aug. 17, 1909, *Wooton.* On *Bouteloua curtipendula* (Michx.) Torr.: Filmore Canyon, Organ Mts., Sept. 20, 1908, *Standley.* Reported (as *Aecidium Brandegei* Peck) from Las Vegas, on "*Asclepias subverticillata* (A. Gray) Vail" (apparently *A. galioides* H. B. K.) by Johnson (Proc. Ind. Acad. Sci. **1911**: 399. 1912).

PUCCINIA KOELERIAE Arthur

I. (*Aecidium Fendleri* Tracy & Earle). On leaves of *Berberis Fendleri* A. Gray: Winsor's Ranch, June 30, 1908, *Standley 4078.*

PUCCINIA LOBATA Berk. & Curt.

On *Disella lepidota* (A. Gray) Greene: San Andreas Mts., Sept. 23, 1912, *Wooton.* On leaves of *Disella hederacea* (Dougl.) Greene: Mesilla Valley, Oct. 15, 1901, Oct. 29, 1903, *Wooton.* On leaves of cultivated hollyhocks (*Althaea rosea* L.): Mesilla

Valley, Sept. 15, 1899, Oct. 1, 1904, *Wooton;* Pecos, Aug. 26, 1908, *Standley 5324.*

PUCCINIA LUXURIANS Syd.

On *Sporobolus airoides* Torr.: Brazito, Sept. 1, 1915, *W. A. Archer 13.*

PUCCINIA MENTHAE Pers.

On leaves of *Mentha Penardi* (Briq.) Rydb.: Brazos Canyon, Sept. 3, 1914, *Standley & Bollman 11119.* On leaves of *Monarda stricta* Wooton: Brazos Canyon, Aug. 27, 1914, *Standley & Bollman 10884.* Reported by Cockerell from Pecos on the latter host.

PUCCINIA MONOICA (Peck) Arthur

I. On *Arabis Fendleri* (S. Wats.) Greene: Santa Fe, May, 1897, *Heller.* On leaves of *Arabis oxyphylla* Greene: Grass Mt., July 16, 1908, *Standley 4368.* On "*Draba aurea*": Coolidge, June 20, 1887, *Tracy & Evans.* Reported by Cockerell from Las Vegas, on *Sophia incisa* (Engelm.) Greene.

PUCCINIA MONTANENSIS Ellis

[*Aecidium Hydrophylli* Peck; *Aecidium Phaceliae* Peck.]

On some unidentified grass: Albuquerque, Nov. 1, 1914, *W. H. Long.* On leaves of *Hydrophyllum Fendleri* (A. Gray) Heller (I): Winsor's Ranch, July 1, 1908, *Standley 4128;* Beulah, *Cockerell.* On leaves of *Phacelia heterophylla* Pursh (I): Winsor Creek, Aug. 4, 1908, *Standley 4749;* Chama, July 9, 1911, *Standley 6619;* Beulah, *Cockerell.* On *Koeleria cristata* (L.) Pers.: Organ Mts., Feb. 22, 1914, *Arthur & Fromme 5605.*

PUCCINIA MUHLENBERGIAE Arth. & Holw.

(*Aecidium Sphaeralceae* Ellis & Ev.; *Puccinia tosta* Arthur.)

On leaves of *Muhlenbergia repens* (Presl) Hitchc. (*Sporobolus utilis* (Torr.) Scribn.): Mesilla Valley, Oct. 15, 1903, *Wooton 3731.* On leaves of *Sporobolus asperifolius* (Nees & Mey.) Thurb.: Mesilla Park, Feb. 19, 1914, *Arthur & Fromme 5504,*

5055; Agricultural College, June 28, 1911, *Standley 6382;* Albuquerque, December, 1914, *W. H. Long 5181.* On leaves of *Sphaeralcea lobata* Wooton: Agricultural College, June 28, 1911, *Standley 6393;* Mesilla, June 19, 1897, *Wooton;* Pecos, Aug. 22, 1908, *Standley 5185.* On *Disella hederacea* (Dougl.) Greene (*Sida hederacea* (Dougl.) Torr.): Hatch, June 22, 1914, *W. A. Archer;* Mesilla Park, July 13, 1914, *W. A. Archer.* On *Muhlenbergia squarrosa* (Trin.) Rydb.: Las Vegas, Oct. 5, 1901, *Cockerell.*

The type of *Aecidium Sphaeralceae* was collected at Las Cruces on "*Sphaeralcea angustifolia* Don" (*S. lobata* Wooton).

PUCCINIA OBTECTA Peck

On *Scirpus americanus* Pers.: Mesilla, Oct. 5, 1915, *W. A. Archer 11.*

PUCCINIA PHILIBERTIAE Ellis & Ev.

The type was collected "on leaves and follicles of *Philibertia viriflora?* Britton and Rusby," near Las Cruces, *Wooton 43.*

PUCCINIA POCULIFORMIS (Jacq.) Wettst.

[*P. graminis* Pers.]

On leaves of *Triticum vulgare* L.: Pecos, Aug. 22, 1908, *Standley 5178.* On leaves of *Avena fatua* L.: Pecos, Aug. 22, 1908, *Standley 5180.* On leaves of *Hordeum jubatum* L.: Pecos, Aug. 25, 1908, *Standley 5312.* On leaves of *Agropyron Smithii* Rydb.: Dulce, Aug. 19, 1911, *Standley 8079.*

PUCCINIA PSEUDOCYMOPTERI Holway

On leaves and stems of *Pseudocymopterus montanus* (A. Gray) Coult. & Rose: Chama, July 10, 1911, *Standley 6774;* Dulce, Aug. 20, 1911, *Standley 8169;* Brazos Canyon, Sept. 1, 1914, *Standley & Bollman 11011.*

PUCCINIA PUNCTATA Link

On *Galium asperrimum* A. Gray: Cloudcroft, Sept. 16, 1903, *E. W. D. Holway* (*Syd. Ured. 2037*) (Arthur in litt.).

PUCCINIA SHERARDIANA Körn.

On leaves of *Malvastrum elatum* (Baker) A. Nels.: Pecos, Aug. 15, 1908, *Standley 4963*.

PUCCINIA SORGHI Schw.

On leaves of cultivated maize (a Mexican variety): Pecos, Aug. 25, 1908, *Standley 5286*.

PUCCINIA SPHAERALCEAE Ellis & Ev.

On *Sphaeralcea arenaria* Woot. & Standl.: San Andreas Mts., Oct. 10, 1914, *Wooton*. On *Sphaeralcea incana* Torr.: Organ Mts., Feb. 22, 1914, *Arthur & Fromme 5608, 5609*. On leaves and stems of *Sphaeralcea marginata* York: Farmington, July 18, 1911, *Standley 7018*. On leaves of *Sphaeralcea lobata* Wooton: Pecos, Aug. 22, 1908, *Standley 5184*. On leaves and stems of *Sphaeralcea Fendleri* A. Gray: Cedar Hill, Aug. 17, 1911, *Standley 8046;* Dulce, Aug. 20, 1911, *Standley 8164*. On *Disella hederacea* (Dougl.) Greene (*Sida hederacea* (Dougl.) Torr.): Agricultural College, October, 1915, *W. A. Archer 22*.

PUCCINIA SPLENDENS Vize.

On leaves and stems of *Hymenoclea monogyra* Torr. & Gray: Mesa west of Organ Mts., Oct. 6, 1904, *Wooton 3793*. The fungus is very abundant upon this shrub in southern New Mexico, forming great knots upon the branches suggestive of the black knot of plums and cherries.

PUCCINIA STIPAE Arthur

I. On leaves of *Solidago Pitcheri* Nutt.: Gilmore's Ranch, Aug. 17, 1908, *Wooton*.

PUCCINIA SUBNITENS Dietel

On *Salsola pestifer* A. Nels.: Mesilla Park, April 25, 1915, *W. A. Archer*. On leaves of *Sophia incisa* (Engelm.) Greene (I): James Canyon, June 26, 1899, *Wooton*. On *Chenopodium album* L.: Mesilla Park, April 25, 1915, *W. A. Archer* (I). On

Chenopodium pratericola Rydb. (I): Mesilla Park, April 25, 1915, *Archer*. On young plant of *Chenopodium Fremonti* S. Wats. (I): Mesilla Park, April 26, 1915, *Archer*. On leaves of *Distichlis spicata* (L.) Greene: Mesilla Park, Feb. 19, 1914, *Arthur & Fromme 5502;* Albuquerque, Nov. 9, 1914, *W. H. Long 3672;* Mesquite Lake, June 14, 1908, *Standley 3932;* San Antonio, Oct. 15, 1907, *J. D. Tinsley;* Farmington, July 17, 1911, *Standley 6898*. Reported (as *Aecidium Lepidii* Tr. & Gall.) by Cockerell (Jour. Myc. **10**: 51. 1904) from Hagerman, on *Lepidium alyssoides* A. Gray.

PUCCINIA TARAXACI Plow.

On leaves of *Taraxacum Taraxacum* (L.) Karst.: Chama, July 9, 1911, *Standley 6697*.

PUCCINIA TUBERCULANS Ellis & Ev.

On leaves of *Isocoma heterophylla* (A. Gray) Greene: Mesilla Valley, Oct. 4, 1899, *Wooton*.

PUCCINIA TUMIDIPES Peck

On leaves of *Lycium pallidum* Miers: Farmington, July 19, 1911, *Standley 7071;* Carrizo Mts., July 30, 1911, *Standley 7449*.

PUCCINIA UNIVERSALIS Arthur

I. On leaves of *Artemisia franserioides* Greene: Beatty's Cabin, Aug. 8, 1908, *Standley 4840*.

PUCCINIA VERATRI Clinton

On leaves of *Veratum speciosum* Rydb.: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10946*. Reported by Cockerell from Beulah.

PUCCINIA VIOLAE (Schum.) DC.

On leaves of *Viola canadensis* L.: Cloudcroft, Aug. 8, 1899, *Wooton*. On leaves of *Viola nephrophylla* Greene: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10651*.

PUCCINIA XANTHII Schw.

On leaves of *Xanthium commune* Britton: Mesilla Valley, Oct. 13, 1898, *Wooton;* Farmington, July 19, 1911, *Standley 7076;* Carrizo Mts., Aug. 1, 1911, *Standley 7492.* Reported by Cockerell from Roswell.

PUCCINIASTRUM AGRIMONIAE (Schw.) Tranz.

On *Agrimonia striata* Michx.: [Las Vegas?] Hot Springs, Sept. 15, 1896, *Holway.*

PUCCINIASTRUM MYRTILLI (Schum.) Arthur

On leaves of *Vaccinium oreophilum* Rydb.: Brazos Canyon, Sept. 8, 1914, *Standley & Bollman 11199.*

PUCCINIASTRUM PUSTULATUM (Pers.) Dietel

On *Chamaenerion angustifolium* (L.) Scop.: Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10635.* On leaves and stems of *Epilobium novomexicanum* Hausskn.: Farmington, July 18, 1911, *Standley 7045;* Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10947.*

RAVENELIA MESILLIANA Ellis & Barth.

The type was collected at Mesilla, New Mexico, on *Cassia bauhinioides* A. Gray. The species is known only from this locality.

RAVENELIA VERSATILIS (Peck) Dietel

On *Acacia Greggii* A. Gray: Rio Gila, Aug. 15, 1902, *Wooton 3743.* The species is confined, so far as known, to this host and occurs also in Texas, Arizona, and California.

TRANZSCHELIA PUNCTATA (Pers.) Arthur

[*Puccinia Pruni-spinosae* Pers.]

On cultivated apricots: Mesilla Valley, June, 1908, *Wooton.*

UREDINOPSIS PTERIDIS Diet. & Holw.

On *Pteridium aquilinum pubescens* Underw.: Brazos Canyon, Aug. 21, 1914, *Standley & Bollman 10692*. Arthur, in the North American Flora, reports the species from California, Washington, and Florida.

UROMYCES ALBUS Diet. & Holw.

I. On leaves of *Vicia americana* Muhl.: Sierra Grande, June 20, 1911, *Standley 6219;* Winsor's Ranch, July 8, 1908, *Standley 4256;* Chama, July 13, 1911, *Standley 6825.*

UROMYCES APPENDICULATUS (Pers.) Fries

On leaves and fruit of *Phaseolus vulgaris* L. (cultivated): Mesilla Valley, Oct. 10, 1905, *Wooton*. Reported by Arthur (N. Am. Fl. 7: 258. 1912) from New Mexico on *Strophostyles* sp.

UROMYCES ARCHERIANUS Arthur & Fromme

III. On *Chloris elegans* H. B. K.: Mesilla Park, March 22, 1915, *W. A. Archer.*

UROMYCES ASTRAGALI Sacc.

On *Astragalus Wootoni* Sheld.: Mesquite Lake, June 14, 1908, *Standley 3931;* Range Reserve, Dona Ana Co., May 14, 1913, *Wooton.* On *Astragalus* sp.: Las Vegas, June 2, 1900, *T. A. Williams.* Reported by Arthur from Colorado or Arizona on the following hosts, all of which are found in New Mexico: *Oxytropis Lamberti, Astragalus amphioxys, A. Bigelovii, A. crassicarpus, A. mollissimus,* and *A. Thurberi.*

UROMYCES COMPACTUS Peck

On *Leucosyris spinosus* (Benth.) Greene: Brazito, Sept. 1, 1915, *W. A. Archer 3* (I); Brazito, October, 1915, *Archer 24* (III).

UROMYCES ERIOGONI Ellis & Hark.

On leaves of *Eriogonum racemosum* Nutt.: Tunitcha Mts., Aug. 8, 1911, *Standley 7757;* Dulce, Aug. 20, 1911, *Standley 8221;* Chama, July 11, 1911, *Standley 6814.* Reported by Arthur from other states on the following species which occur in New Mexico: *Eriogonum cernuum, E. effusum,* and *E. lonchophyllum.*

UROMYCES FABAE (Pers.) De Bary

On leaves of *Lathyrus leucanthus* Rydb.: Dulce, Aug. 20, 1911, *Standley 8170;* Brazos Canyon, Aug. 20, 1914, *Standley & Bollman 10636.* On leaves and stems of *Vicia americana* Muhl.: Dulce, Aug. 20, 1911, *Standley 8182;* Brazos Canyon, August, 1914, *Standley & Bollman 10667, 10986.* The species may be looked for in New Mexico on the following hosts upon which it occurs elsewhere: *Lathyrus arizonicus* and *L. decaphyllus.*

UROMYCES GENTIANAE Arthur

On all chlorophyll-bearing parts of *Amarella heterosepala* (Engelm.) Greene: Brazos Canyon, Sept. 3, 1914, *Standley & Bollman 11089.* The species is reported from Colorado on *Amarella strictiflora* and may be expected in New Mexico on the same host.

UROMYCES GLYCYRRHIZAE (Rab.) Magn.

On leaves and stems of *Glycyrrhiza lepidota* Nutt.: Mesilla Valley, *Wooton;* Agricultural College, June 28, 1911, *Standley 6398;* Pecos, Aug. 15, 1908, *Standley 4964;* Cedar Hill, Aug. 16, 1911, *Standley 8009;* Taos, Aug. 9, 1910, *Wooton.*

UROMYCES HYALINUS Peck

On leaves and stems of *Sophora sericea* Nutt.: Mesilla Valley, June 12, 1900, *Wooton 3725;* Mesilla Park, May 31, 1914, *W. A. Archer.* Reported from Las Vegas by Cockerell.

UROMYCES LIMONII (DC.) Lév.

I. On *Limonium limbatum* Small: Roswell, June, 1899, *J. D. Tinsley;* south of Tularosa (*Cockerell*). In the North American Flora this is not reported from the region between California and Mississippi.

UROMYCES MEDICAGINIS Pass.

On leaves of *Medicago sativa* L.: Chamberino, Oct. 16, 1907, *J. H. Bruce*. The species should be found in New Mexico on *Medicago lupulina,* since it occurs elsewhere on that host.

UROMYCES MYSTICUS Arthur

On leaves of *Hordeum jubatum* L.: Farmington, July 22, 1911, *Standley 7172* (II); Shiprock, Aug. 12, 1911, *Standley 7884*. Reported in the North American Flora only from Colorado and Utah.

UROMYCES OCCIDENTALIS Dietel

On leaves of *Lupinus ammophilus* Greene: Dulce, Aug. 20, 1911, *Standley 8234;* a new host. On leaves of *Lupinus Kingii* S. Wats.: G O S Ranch, 1911, *J. M. Holzinger*.

UROMYCES PLUMBARIUS Peck

On all chlorophyll-bearing parts of *Gaura induta* Woot. & Standl.: Pecos, Aug. 22, 1908, *Standley 5176;* Dulce, Aug. 19, 1911, *Standley 8102;* Farmington, July 22, 1911, *Standley 7173*. This species is reported from Colorado upon *Gaura glabra* Lehm., but the host is probably rather *Gaura induta. Uromyces plumbarius* occurs in other states upon *Gaura coccinea, G. parviflora, G. villosa, Pachylophus hirsutus,* and *P. macroglottis,* and should be sought in New Mexico upon the same hosts. It may be expected to occur also upon some of our Oenotheras, for it is found elsewhere on *O. biennis*.

UROMYCES PROEMINENS (DC.) Pass.

On leaves of *Chamaesyce serpyllifolia* (Pers.) Small: Farmington, July 22, 1911, *Standley 7160;* Cedar Hill, Aug. 16, 1911,

Standley 8014 (III). Silver City Draw, July 1, 1906, *Wooton 3720*. On leaves of *Chamaesyce glyptosperma* (Engelm.) Small: Dulce, Aug. 20, 1911, *Standley 8163*. On *Chamaesyce stictospora* (Engelm.) Small: San Andreas Mts., Oct. 6, 1912, *Wooton;* a new host. On leaves of *Zygophyllidium bilobatum* (Engelm.) Standley: Santa Rita, Aug. 1, 1911, *J. M. Holzinger;* a new host. To be expected in New Mexico upon the following hosts upon which it is reported elsewhere: *Chamaesyce albomarginata, C. Fendleri, C. Geyeri, C. lata, C. petaloidea, C. serpens, Dichrophyllum marginatum,* and *Poinsettia dentata.*

UROMYCES PSORALEAE Peck

On leaves and stems of *Psoralea micrantha* A. Gray: Dulce, Aug. 19, 1911, *Standley 8069.*

UROMYCES RUDBECKIAE A. & H.

On leaves of *Rudbeckia laciniata* L.: Brazos Canyon, Aug. 25, 1914, *Standley & Bollman 10818.*

UROMYCES SILPHII (Burrill) Arthur

On *Juncus longistylis* Torr.: Costilla Valley, Sept. 6, 1913, *Wooton.* On *Juncus interior* Wiegand: McKinney's Park, Socorro Co., Aug. 23, 1903, *Metcalfe.*

UROMYCES SPECIOSUS Holway

The type was collected by Holway at Cloudcroft, New Mexico, on "*Frasera macrophylla.*" Examination of a portion of the type collection forwarded to the writer by Dr. Arthur shows that the host is *Frasera speciosa* Dougl.

UROMYCES TRANZSCHELII Syd.

On leaves of *Tithymalus* sp.: Near Fairview, July 18, 1904, *Wooton.*

UROPYXIS AMORPHAE (M. A. Curt.) Schröt.

On *Amorpha nana* Nutt.: [Las Vegas?] Hot Springs, Sept. 13, 1896, *E. W. D. Holway* (*Bartholomew 772*). On *Amorpha cali-*

fornica Nutt.: Las Cruces, Oct. 27, 1892, *Wooton;* west of Roswell, Aug. 30, 1900, *Earle 377*. The species occurs elsewhere on *Amorpha canescens* and may occur in New Mexico on that host.

UROPYXIS PETALOSTEMONIS (Farl.) De Toni

II. On stems and leaves of *Petalostemum oligophyllum* (Torr.) Rydb.: Pecos, Aug. 15, 1908, *Standley 4960*. To be expected in New Mexico upon *P. purpureum,* since it is reported from other states upon that host.

UROPYXIS SANGUINEA (Peck) Arthur

On leaves of *Odostemon repens* (Lindl.) Cockerell: Chama, July 10, 1911, *Standley 6767;* Winsor's Ranch, June 30, 1908, *Standley 4085;* Dulce, Aug. 20, 1911, *Standley 8181;* Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10937*.

UROPYXIS WOOTONIANA Arthur

II, III. On leaves of *Odostemon haematocarpus* (Wooton) Heller: Organ Mts., Dec. 23, 1903, *Wooton* (type); Filmore Canyon, Organ Mts., Nov. 9, 1908, *Wooton;* Queen, Aug. 1, 1909, *Wooton*. The species might well be expected on a closely related species occurring in New Mexico, *Odostemon Fremontii*.

USTILAGINALES

(Determined by Dr. G. P. Clinton, unless otherwise noted)

CINTRACTIA CARICIS (Pers.) Magn.

On *Carex* sp.: Winsor's Ranch, July 3, 1908, *Standley 4161;* Chama, July 10, 1911, *Standley 6778*.

ENTYLOMA AUSTRALE Speg.

On *Physalis neomexicana* Rydb.: Pecos, Aug. 19, 1908, *Standley 5100*. Determined by Sumstine.

ENTYLOMA COMPOSITARUM Farl.

On *Bidens tenuisecta* A. Gray (a new host): Pecos, Aug. 19, 1908, *Standley 5097*. Determined by Wilson.

SOROSPORIUM CONSANGUINEUM Ellis & Ev.

On *Aristida* sp.: Mesa west of the Organ Mts., Oct. 6, 1904, *Wooton 3794*. Dr. Clinton states that the spores are larger than in the type; consequently the determination is somewhat doubtful.

SOROSPORIUM CONTORTUM Griff.

On *Heteropogon contortus* (L.) Beauv.: Agricultural College, Oct. 5, 1904, *Wooton;* mesa west of Organ Mts., Oct. 15, 1904, *Wooton 3791*. Reported previously only from Arizona and from Jalisco, Mexico.

THECAPHORA DEFORMANS Dur. & Mont.

On *Astragalus Wootoni* Sheld.: Range Reserve, Dona Ana Co., May 14, 1913, *Wooton;* a new host. Reported from adjacent states upon *Astragalus bisulcatus, A. Drummondii, A. Nuttallianus,* and *A. missouriensis,* all of which occur in New Mexico.

TILLETIA ASPERIFOLIA Ellis & Ev.

On *Sporobolus asperifolius* (Nees. & Mey.) Thurb.: Ojo Caliente, Zuni Reservation, July 28, 1904, *Wooton.*

TOLYSPORELLA (?) NOLINAE Clinton.

On *Nolina microcarpa* S. Wats.: Near San Luis Pass, southwestern corner of New Mexico, June 21, 1906, *Wooton.* Reported previously only from the type locality, the Rincon Mts., Arizona.

UROCYSTIS AGROPYRI (Preuss) Schröt.

On *Elymus canadensis* L.: Ojo Caliente, Zuni Reservation, July 28, 1904, *Wooton.* Reported by Clinton (N. Am. Fl. **7**: 58. 1906) from New Mexico on *Agropyron occidentale* (=*A. Smithii* Rydb.).

UROCYSTIS ANEMONES (Pers.) Wint.

Reported from New Mexico on *Pulsatilla hirsutissima* (Pursh) Britton by Clinton (N. Am. Fl. **7**: 55. 1906).

USTILAGO AVENAE (Pers.) Jens.

On *Avena sativa* L.: Shiprock, Aug. 11, 1911, *Standley 7870*, in part; Ponchuelo Creek, July 30, 1908, *Standley 4592*.

USTILAGO BROMIVORA (Tul.) Fisch. de Waldh.

On *Bromus polyanthus* Scribn.: Pecos, Aug. 25, 1908, *Standley 5317*.

USTILAGO BUCHLOES Ell. & Tracy

The type (on *Bulbilis dactyloides*) was collected at Coolidge (now known as Guam), New Mexico. The species is reported also from Nebraska.

USTILAGO CALCARA Griff.

The type was collected at Roswell, New Mexico, May 4, 1903, on *Bouteloua breviseta* Vasey. The species is reported only from this state.

USTILAGO HIERONYMI Schröt.

On *Bouteloua eriopoda* Torr.: East of Dona Ana Mts., Sept. 6, 1908, *Wooton;* mesa west of Organ Mts., Oct. 25, 1904, *Wooton*. On *Bouteloua breviseta* Vasey: Roswell, according to Griffiths (Bull. Torrey Club **31**: 87. 1903; Clinton, N. Am. Fl. **7**: 13, 1906). Also reported by Clinton (l. c.) from New Mexico on *Bouteloua oligostachya* (= *B. gracilis* (H. B. K.) Lag.). The species occurs in adjacent regions on *Bouteloua curtipendula* (Michx.) Torr., *B. aristidoides* (H. B. K.) Griseb., *B. barbata* Lag., *Dasyochloa pulchella* (H. B. K.) Willd., and *Pappophorum Wrightii* Munro, all of which are found in New Mexico.

USTILAGO HILARIAE Ellis & Tracy

On *Hilaria mutica* (Buckl.) Benth.: East of Dona Ana Mts., Sept. 6, 1908, *Wooton*. The type was collected at Albuquerque, New Mexico, on *Hilaria Jamesii* (Torr.) Benth.

USTILAGO HORDEI (Pers.) Kellerm. & Swingle.

On cultivated barley: Mora, Aug. 11, 1910, *Wooton*.

USTILAGO HYPODYTES (Schlecht.) Fries

On *Stipa Vaseyi* Scribn.: Pecos, Aug. 22, 1908, *Standley 5189;* Raton Mts. (Griffiths, Bull. Torrey Club 31: 86. 1903). On *Distichlis spicata* (L.) Greene; Roswell (Griffiths, op. cit. 87. 1903). Reported from adjacent states on *Oryzopsis hymenioides* (R. & S.) Ricker and *Sporobolus cryptandrus* (Torr.) A. Gray, two grasses abundant in New Mexico.

USTILAGO LEVIS (Kellerm. & Swingle) Magn.

On *Avena sativa* L.: Shiprock, Aug. 11, 1911, *Standley 7870,* in part; Pecos, Aug. 19, 1908, *Standley 5075;* Farmington, July 18, 1911, *Standley 7051.*

USTILAGO MUHLENBERGIAE P. Henn.

The type was collected at [Las Vegas?] Hot Springs, New Mexico, on "*Muhlenbergia Pringlei.*" That species is not known to occur in New Mexico. The same smut is reported from Arizona on *Muhlenbergia Porteri* Scribn., a species common in New Mexico.

USTILAGO ZEAE (Beckm.) Unger.

On cultivated maize: Pecos, Aug. 25, 1908, *Standley 5287.*

AGARICALES

AGARICUS CAMPESTRIS L.

Reported by Cockerell from Pecos.

CLAUDOPUS NIDULANS (Pers.) Peck

On spruce log: Brazos Canyon, Sept. 2, 1914, *Standley & Bollman 11059*. Determined by Murrill.

COPRINUS ATRAMENTARIUS (Bull.) Fries

Reported from Pecos by Cockerell.

COPRINUS MICACEUS (Bull.) Fries

Reported from Pecos by Cockerell.

CORIOLUS ABIETINUS (Dicks.) Quél.

On spruce log: Brazos Canyon, Sept. 7, 1914, *Standley & Bollman 11184*. On dead fir: Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10897*. Determined by Murrill.

CORIOLUS LIMITATUS (Berk. & Curt.) Murrill

[*Trametes limitata* Berk. & Curt.]

The type is said to have been collected in New Mexico by Bigelow. It may, however, have come from Arizona, as Bigelow did not distinguish the two states.

CORIOLUS VERSICOLOR (L.) Quél.

Lookout Mine, Sierra Co., June 14, 1904, *O. B. Metcalfe*. Determined by Murrill.

FOMES ELLISIANUS F. W. Anders.

Reported from New Mexico by Murrill (N. Am. Fl. 9: 98. 1908). It grows upon living branches of *Lepargyrea argentea* (Nutt.) Greene.

HYPHOLOMA PECOSENSE Cockerell

The type was collected at Pecos, June, 1903, by Dr. M. Grabham.

POLYPORUS ARCULARIUS (Batsch) Fries

Reported from Pecos by Cockerell.

PYROPOLYPORUS EARLEI Murrill

The type was collected by Earle, August, 1900, on "a standing trunk of *Juniperus*," in the Capitan Mts.

PYROPOLYPORUS IGNIARIUS (L.) Murrill

Collected in New Mexico by Earle (probably in the Capitan Mts.) according to Murrill (Bull. Torrey Club **30**: 111. 1903).

PYROPOLYPORUS PRAERIMOSUS Murrill

The type was collected by Earle, July, 1900, "on *Quercus undulata*," in the Capitan Mts., at an altitude of 2100 meters.

STROPHARIA STERCORARIA Fries

A specimen so determined by Mrs. F. W. Patterson was collected at Pecos by Cockerell.

LYCOPERDALES

BATTAREA LACINIATA Underw.

The type was collected at Mesilla Park by Cockerell.

CHLAMYDOPUS CLAVATUS Speg.

Three collections from Las Cruces and Mesilla Park are reported by White (Bull. Torrey Club **28**: 437. 1901).

CYATHIA HIRSUTA (Schaeff.) White

Brazos Canyon, Aug. 26, 1914, *Standley & Bollman 10837*. Determined by Murrill.

GEASTER FLORIFORMIS Rit.

Reported from Las Vegas Hot Springs by Cockerell.

GEASTER HYGROMETRICUS Pers.

Reported from Soledad Canyon, Organ Mts., by Cockerell.

TYLOSTOMA FIMBRIATUM Fries

White (Bull. Torrey Club 28: 434. 1901) reports a specimen collected in New Mexico by Wright. The collection may have come from New Mexico, or it may have been collected in Arizona, Sonora, Chihuahua, or western Texas, for many of Wright's plants labeled "New Mexico" came from those four states.

TYLOSTOMA GRACILE White

The type was collected at Las Cruces by Wooton.

TYLOSTOMA PEDUNCULATUM (L.) Schröt.

Reported from New Mexico (3 collections without specific localities) by White (Bull. Torrey Club 28: 429. 1901).

SPHAEROPSIDALES

(Determined by Dr. David R. Sumstine, unless otherwise noted.)

AMPELOMYCES QUISQUALIS Cesati

On *Erysiphe Cichoracearum* on *Mertensia* sp.: Brazos Canyon, Aug. 25, 1914, *Standley & Bollman 10797*. On *Erysiphe Cichoracearum*? on *Phacelia heterophylla* Pursh: Beatty's Cabin, Aug. 8, 1908, *Standley*. Determined by Wilson.

DARLUCA FILUM (Biv.) Cast.

Las Vegas (*Cockerell*). Determined by Earle.

DIDYMARIA CLEMATIDIS Cooke & Hark.

On *Clematis ligusticifolia* Nutt: Ensenada, Sept. 3, 1914, *Standley & Bollman 11078*. Determined by Wilson.

PHOMA LUPINI Ellis & Ev.

On *Lupinus aduncus* Greene: Tunitcha Mts., Aug. 8, 1911, *Standley 7827*. Determined by Fairman.

PHYLLOSTICTA ATRIPLICIS Desm.

On *Chenopodium album* L.: Pecos, Aug. 15, 1908, *Standley 5024*.

PHYLLOSTICTA CRUENTA Tr.

On *Vagnera amplexicaulis* (Nutt.) Morong: Winsor Creek, Aug. 4, 1908, *Standley 4751*.

PHYLLOSTICTA SYMPHORICARPI Wint.?

On *Symphoricarpos oreophilus* A. Gray: Brazos Canyon, Aug. 30, 1914, *Standley & Bollman 10928* (immature).

SEPTORIA EMACULATA Peck & Clinton

On *Lathyrus decaphyllus* Pursh: Pecos, August, 1908, *Standley*.

SEPTORIA PISI Westd.

On *Pisum sativum* L.: Pecos, Aug. 22, 1908, *Standley 5183*. Determined by Wilson.

SEPTORIA POLYGONORUM Desm.

On *Polygonum buxiforme* Small: Pecos, Aug. 21, 1908, *Standley 5157*.

SEPTORIA RIBIS Desm.

On *Ribes inebrians* Lindl.: Dulce, Aug. 19, 1911, *Standley 8097*.

SEPTORIA RUDBECKIAE Ellis & Hark.

On *Ratibida columnifera pulcherrima* (DC.) Woot. & Standl.: Pecos, Aug. 25, 1908, *Standley 5293*.

MONILIALES

(Determined by Dr. David R. Sumstine.)

CLADOSPORIUM HERBARUM (Pers.) Link

On *Dugaldea Hoopesii* (A. Gray) Greene: Chama, July 10, 1911, *Standley 6761*. On *Quercus* sp.: Brazos Canyon, Aug. 31,

1914, *Standley & Bollman 10988.* On *Lepargyrea canadensis* (L.) Greene: Brazos Canyon, Aug. 31, 1914, *Standley & Bollman 10987.*

MACROSPORIUM SOLANI Ell. & Mart.

On cultivated canteloupe: Mangas Springs, Aug. 11, 1902, *Wooton.*

MICROSTROMA ALBUM (Desm.) Sacc.

On *Quercus* sp.: Durfey's Well, July 19, 1904, *Wooton 3744.*

MICROSTROMA JUGLANDIS (Bereng.) Sacc.

On *Juglans major* (Torr.) Heller: 10 miles north of Hermosa, July 15, 1904, *Wooton 3749.*

POLYTHRINCIUM TRIFOLII Kunze

On *Trifolium repens* L.: Near Ensenada, Sept. 3, 1914, *Standley & Bollman 11082.*

RAMULARIA DECIPIENS Ellis & Ev.

On *Rumex crispus* L.: Pecos, Aug. 25, 1908, *Standley 5300.*

RAMULARIA GRINDELIAE E. & K.

On *Grindelia aphanactis* Rydb.: Pecos, Aug. 25, 1908, *Standley 5302.*

RAMULARIA SAMBUCINA Peck

On *Sambucus microbotrys* Rydb.: Beatty's Cabin, Aug. 8, 1908, *Standley 4841.*

TRICHOTHECIUM ROSEUM Fries

Reported by Cockerell from Mesilla, on dead wood of *Sambucus mexicana* Presl.

TUBERCULARIA VULGARIS Tode

Reported by Cockerell from Placita, near Las Vegas, on *Padus melanocarpa* (A. Nels.) Shafer.

UNITED STATES NATIONAL MUSEUM,
WASHINGTON, D. C.

NOTE ON WESTERN RED ROT IN PINUS PONDEROSA

W. H. Long

In the National Forests of Arizona and New Mexico, a varying percentage of the trees of western yellow pine (*Pinus ponderosa*) is affected by a heart-rot, known locally as "red heart," "red rot," "gray rot," "top rot," and "heart rot." The amount of this rot present varies materially with the exposure, slope, and soil on which the yellow pine is growing, as well as with the age of the timber itself.

This heart-rot is called in this paper "western red rot" in order to distinguish it from the true "red heart" or "red rot," a very similar heart-rot common in many species of conifers. True "red rot" or "ring scale" is caused by *Trametes pini*, while "western red rot" is produced by an entirely different fungus.

Western red rot has three stages in its development: (1) An initial stage in which the affected heartwood is firm but shows reddish to dark brown discolored areas; (2) an intermediate stage in which the diseased heartwood is whitish or gray in color and is more or less delignified; and (3) a final stage in which much of the heartwood has disappeared due to the absorption of the delignified portions, while the wood particles left are brittle and easily crumble when handled.

The fungus which causes "western red rot" never forms brown, woody, perennial fruiting bodies on the boles of living affected pine trees as *Trametes pini* does, but forms annual fruiting bodies which usually develop as white encrusting layers on the underside of logs. However, fruiting bodies have been found which have distinct and well-formed pilei. The pileate form of the fungus resembles very closely *Polyporus Ellisianus* (*Tyromyces Ellisianus* of Murrill in North American Flora) and is probably this species.

Western red rot is exceedingly common throughout the western yellow pine regions of Arizona and New Mexico. Specimens of the fungus have also been examined from Vermont, New Jersey, Washington, and Idaho, while a photograph of the rot in western yellow pine has been seen from South Dakota. It is therefore highly probable that the fungus is widely distributed throughout the western states and to a limited extent at least in the northeast.

The western red rot fungus enters the living tree through the heartwood of dead branches in the crown. It first attacks the sapwood of the dead branch, then the heartwood; it then travels down the dead branch into the heartwood of the living tree.

In order to throw some light on the presence of western red rot in western yellow pine and its probable influence on the rotation period, studies were conducted on certain areas in the Santa Fe National Forest, N. Mex., where both tie trees and sawtimber were being cut. These areas were especially suitable for a study of this character, since an unusually large percentage of the black jack (30 to 50 per cent.) and nearly all of the yellow pine (85 to 100 per cent.) were being cut. A marked difference was found in the percentage of black jack (young western yellow pine before it reaches the age of 125 to 150 years) and of yellow pine affected by western red rot on these areas. Of 1815 felled merchantable black jacks examined, only 29 or 1.59 per cent. had this rot, while out of 563 yellow pines, 77 or 13.6 per cent. were attacked by it. The above data show that during the black jack period, the trees are practically free from western red rot but as they grow older, the increasing number of dead branches make them more subject to the attacks of the fungus.

On the areas examined, western yellow pine trees up to 125 to 150 years old were rarely attacked by western red rot, while trees over 200 years old showed a much higher percentage of rot than the younger trees (black jack). It therefore follows that a short rotation will be better for the future health of the forest as far as heart rots are concerned than a long one. It is a fundamental fact that the older a tree is, the more liable it is to be attacked by heart-rotting fungi.

It was also found that western yellow pine trees growing on very thin soil, on steep south or east slopes where growth conditions are poor have a higher percentage of western red rot than trees situated where the growth conditions are good.

Office of Investigations in Forest Pathology,
Bureau of Plant Industry,
Albuquerque, N. Mex.

INTERNAL UREDINIA[1]

J. F. Adams[1]

(With Plate 186, Containing 2 Figures)

The spores of the Uredinales are developed usually in sori just below the cuticle or epidermal layer and are liberated by early rupturing or by the weathering away of the overlying tissue in the case of some resting spores. There are deviations from this development in certain resting spores which are sometimes buried singly in the host tissues which are dependent for liberation also upon the weathering away of the overlying tissues. Exception to the usual development of sori has been reported by Wolf, Reddick, Edgerton, and others.

Internal aecia were first reported by Wolf[2] in *Puccinia angustata* Peck upon *Lycopus virginicus* L., as appearing in the younger tissues of the stem or petiole, being similar in origin, structure, size, and form to those which are erumpent at maturity. Atkinson and Edgerton[2] have observed *Nigredo Caladii* (Schw.) Arth. (*Uromyces Caladii* Farl.) to form internal cluster cups in *Peltandra virginica* (L.) Kunth and Reddick[2] has observed them in the fruits of barberry.

Internal uredinia of *Dicaeoma poculiforme* (Jacq.) Kuntze (*Puccinia graminis* Pers.) liberating the urediniospores into the interior of the hollow stem of rye have been observed by Reddick.[2] Another aberrant case has been found in the production of internal uredinia of *Nigredo caryophyllina* (Schrank.) Arthur (*Uromyces caryophilinus* Schröter) in the leaves of *Dianthus caryophyllus* L. Specimens of the rust-infected leaves were collected from plants growing in the greenhouse of the Pennsylvania State College. The leaves are succulent and are favorable

[1] Contribution from the Department of Botany, Pennsylvania State College, No. 4.

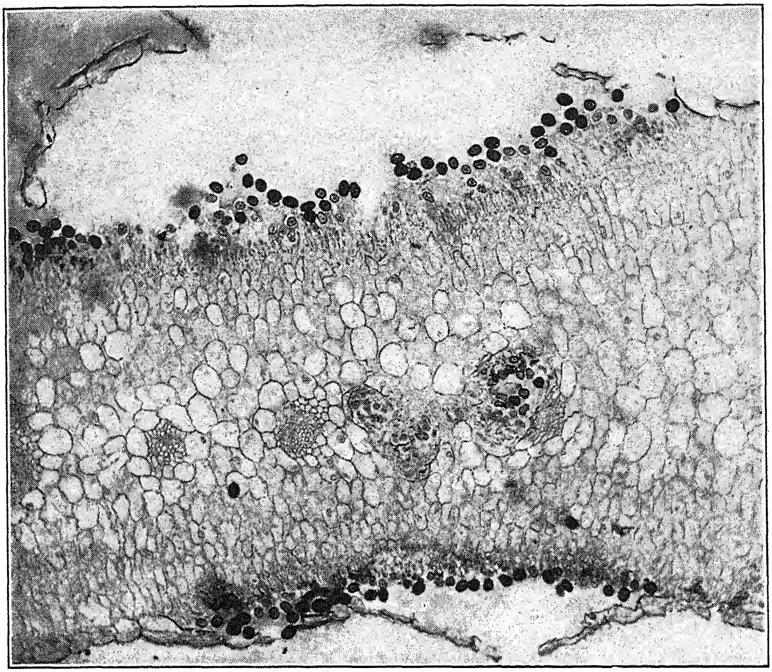
[2] Wolf, F. A., Internal Aecia, Mycologia, Vol. V, No. 6.

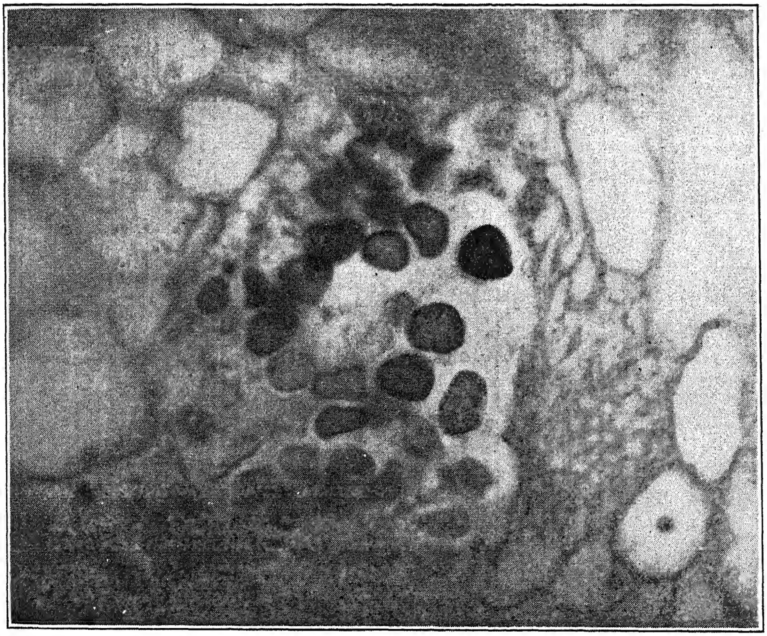
for wide ramification of the rust mycelium. In many instances, the uredinia are found to rupture on opposite surfaces of the leaves and under such conditions internal uredinia were found in the central portion of the mesophyll and occurred as well-developed sori with mature spores. In some instances they were observed to develop adjacent to the bundle tissues.

The mycelium of the internal sori was abundant and could be traced easily to the subepidermal sori. The internal sori appear somewhat spherical and the mycelium produces rather a pseudoparenchymatous layer crowding the adjacent cells of the mesophyll. In some sections, pockets or masses of mycelium were found which evidently were immature sori. The matured spores were similar in size and color to those produced subepidermally.

Since the development of the uredinial stage is supposed to be subepidermal as a rule, this deviation seems worthy of note. Such a deviation from the usual method probably represents an abnormal rather than a typical condition. In this species the development of the internal uredinia is favored by the abundant mycelium from the upper and lower subepidermal sori and by the texture of the leaf which allows wide ramification of the rust mycelium.

STATE COLLEGE, PA.





CROSS SECTION OF CARNATION LEAF WITH THREE INTERNAL SORI, ONE OF WHICH IS ENLARGED IN THE LOWER FIGURE

NOTES AND BRIEF ARTICLES

Mr. A. S. Rhoads, assistant in forest botany at Syracuse University, visited the Garden April 20–23 to consult the collection of Polyporaceae in the mycological herbarium.

Mr. C. C. Hanmer, of East Hartford, Connecticut, has sent in a very interesting specimen of *Russula flava* Romell collected by him at Kineo, Maine, in August, 1911. The specimen grew alone beneath a log covered with clusters of *Armillaria mellea* and one of the "shoestring cords" of this fungus came in contact with the moist upper surface of the *Russula* and developed a tiny hymenophore of the *Armillaria,* which in the dried state is nearly 2 cm. high. Spores from the *Armillaria* clusters fell plentifully upon the *Russula* and the stipe of the young *Armillaria* was partly imbedded in the surface of the *Russula,* strongly suggesting to Mr. Hanmer at first glance that it had developed in some unusually rapid way from one of these spores. A tiny bit of black "cord" projecting from the base of the young stipe tells the story. It might be interesting to students to follow this up with a few experiments.

The subject of edible mushrooms has become very popular of late and many inquiries have been received regarding reliable literature. It can now be stated that there is in press and very soon to appear a large colored chart and a descriptive handbook containing the principle edible and poisonous species of fungi found in America. It is hoped that much safe and useful information will be disseminated by means of this long desired publication.

A New Species of Colus from Pennsylvania

Colus Schellenbergiae Sumstine, sp. nov.

Volva dark-brown, smooth, globose, 2–3 cm. in diameter, breaking at maturity into several irregular segments; receptaculum

stipitate, the stipitate portion cylindric, hollow, reticulate-pitted, white below, orange-colored above, slightly enlarged upward, dividing into three arms; arms arched outward, united at the apex, transversely wrinkled, cylindric or sometimes compressed so as to appear triquetrous, orange-colored, attenuate upward, 3–6 cm. long; gleba dark-green, borne on the inner side of the arms, foetid; spores hyaline, ellipsoid-ovoid, 4.5–5.5 $\mu \times$ 2–2.5.

Growing in the yard of Mrs. F. F. Schellenberg, Pittsburgh, Pa., July, 1915. Type specimens have been deposited in the Carnegie Museum, Pittsburgh, Pa., and in the New York Botanical Garden. Plants developed from eggs removed from the ground had very long arms, but the stipitate portion of the receptaculum was very short. The description of *Colus javanicus* Penzig agrees in a general way with my plants. The former are smaller. I do not have access to the original description, and Saccardo in the *Sylloge* does not give the color of *C. javanicus,* so I have not been able to compare the two species with respect to color.

DAVID R. SUMSTINE.

REVIEW OF KNIEP'S BEITRÄGE ZUR KENNTNIS DER HYMENOMYCETEN, III[1]

Kniep in his previous report[2] on the question of the origin of the binucleated cells in the Basidiomycetes mentioned the appearance of small bodies in the clamp connections which appeared to him to be disintegrating nuclei. In his present paper he makes these indefinite bodies the basis of a new theory in explanation of how the binucleated cells in the Basidiomycetes arise. In accordance with his new view, he accepts the fact that the binucleated cells arise before the anlage of the carpophore is formed. While his previous observations are correct, he now interprets them as abnormalities. The present article deals with a cytological study of *Corticium varians* sp. nov. and *Corticium serum* Pers. These species have a single nucleated spore and the nucleus divides after the spore germinates. A young mycelial cell has but a single nucleus but at the time a clamp connection is formed the nucleus

[1] Kniep, Hans, Bot. Zeit. 7: 369–398, *pl. 2, fig. 1–20.*

[2] Kniep, Hans, Beiträge zur Kenntnis der Hymenomyceten I, II. Bot. Zeit. 5: 594–637, *pl. 2–4, f. 1.* 1913.

divides. Kniep holds that the clamp is budded from the mycelial cell at some point between the two nuclei. So soon as the clamp is sufficiently large one of the nuclei moves into it while the other comes to lie near its base. Conjugate division of the nuclei now takes place. The daughter nuclei arrange themselves so that two non-sister nuclei move to the apical portion of the cell, one remains in the basal portion while the fourth is left in the clamp connection. Kniep finds that the cross wall of the mother cell does not appear until after the clamp has budded out and that it is formed directly below the origin of the clamp connection. Later a second wall appears at the base of the clamp separating it from the apical cell. The result of these processes is a binucleated apical cell, a uninucleated basal cell, and the clamp with a small nucleus. Fusion of the basal cell and the clamp connection now takes place and the nucleus of the clamp connection passes into the basal cell. Thus making the basal cell also binucleated. When a branch is formed, practically the same sequence of phenomena occurs. One nucleus remains in the mother cell, the other migrates to the new branch and a clamp connection is formed between them. In old mycelial cells fusion of the clamp connection and the basal cell takes place quite regularly. Kniep found this peculiar type of conjugate division also in *Panus stipticus, Clitocybe flaccida,* and *Polyporus destructor,* but unfortunately he gives no figures in spite of the fact that these forms have been studied by other cytologists who failed to find such divisions.

Kniep also takes up the question of the phylogenetic significance of the clamp connection. Kniep claims that the binucleated mycelial cells are the homologues of the ascogenous hyphae. He also contends that the penultimate cell of the ascogenous hyphae is the homologue of the apical mycelial cell, and the clamp connection is the homologue of the end cell in an ascogenous hypha. The question that naturally suggests itself is: Does the apical mycelial cell of the Basidiomycetes become the basidium as the penultimate cell becomes the ascus in the Ascomycetes? Kniep claims to have traced the hyphae in a number of forms and found that there is a clamp connection between every two adjacent binucleated cells and there is likewise a clamp connection at the base of each basidium. But in *Lactarius piperatus* Scop., *Tricho-*

loma imbricatum Quél., and *Amanitopsis vaginata* Roze, no such clamp connections appear. According to Harper (Bot. Gaz. 1902), there are no clamp connections between the basidia and the subhymenial cells in *Hypochnus subtilis* and *Coprinus ephemerus.* Buller (Researches on Fungi, 1909) figures no clamps at the bases of the basidia in a number of *Coprinus* species. My own studies on *Coprinus micaceus, C. ephemerus,* and *C. stercorarius* (unpublished) fail to show clamp connections on the basidia of these forms. In over twenty species of Boleti (Bull. Torr. Club, 1913) no clamp connections were observed on the basidia. Yates's figures of his histological studies of certain Boletaceae (Univ. Calif. Publ. 1916) also show no clamp connections.

Kniep fails to trace the hyphae in the trama and to tell definitely whether or not he found clamp connections in these hyphae. Kniep's theory of the clamp cell is not supported by sufficient evidence and it still remains to trace out the origin and the history of the binucleated hyphae through to the basidia. This undoubtedly will clear up many questions on the morphology of the higher Basidiomycetes. MICHAEL LEVINE.

A VERY DANGEROUS MUSHROOM

The poisonous mushroom described below was brought to me for critical examination on May 1, 1916, by Mrs. Rufus Hatch, of Pelham Manor, New York. It grew plentifully in her mushroom beds the past winter, almost to the exclusion of the common cultivated mushroom, and was eaten by Mrs. Hatch and four members of her household with nearly fatal results. A full description of the effects will be published; but it is considered important to send out a warning immediately that *poisonous mushrooms may apparently develop from commercial spawn and that growers must be careful to eat or sell from their mushroom beds only the common mushroom with white cap and pink gills, Agaricus campester.*

Panaeolus venenosus sp. nov.

Pileus thick, fleshy, hemispheric when very young, sometimes hatshaped, at length expanded, cespitose, 3–5 cm. broad; surface

moist, slightly viscid when very young, hygrophanous, bay becoming fulvous or isabelline according to age and moisture conditions, glabrous, smooth on the umbo, rugose and folded on the broad rim when in the hat-like stage; margin entire to lobed, not projecting, smooth, entirely free from fibrils or remnants of a veil, incurved when young, marked with a water-soaked, dark-fulvous zone about 3 mm. broad; context white or slightly yellowish, very thick at the center and very thin toward the margin, the odor and taste resembling that of the common mushroom; lamellae squarely adnate, without sinus or decurrent tooth, plane, somewhat semicircular in shape, at least when young, inserted, fuliginous, gray or whitish on the edges, not distinctly marbled, purplish-fuliginous when viewed from below, of medium distance, about 8 mm. broad; spores ellipsoid or ovoid, somewhat pointed or narrowed at both ends, black, smooth, opaque, 11–13 $\times$ 7–8.5 μ; cystidia not found; stipe thick, fleshy, sometimes equal but often much enlarged upward, whitish or rosy-isabelline, not polished, longitudinally striate at the apex, whitish, pruinose above, whitish-tomentose below, conspicuously hollow, 6–10 cm. long, 5–10 mm. thick.

Type collected by Mrs. Rufus Hatch in her mushroom beds at Pelham Manor, New York, May 1, 1916 (herb. N. Y. Bot. Gard.).

At first sight, the specimens suggested the genus *Psilocybe,* since the gills were purplish-brown and the margin did not project beyond them; but the spore-print proved to be black and the spores typically those of the genus *Panaeolus.* The species is aberrant and might be placed in a different group or subgroup with species like *Panaeolus digressus* Peck and *Panaeolus acidus* Sumstine. Other species of *Panaeolus* have been considered somewhat poisonous, but apparently none have exhibited such poisonous properties as this.

W. A. MURRILL.

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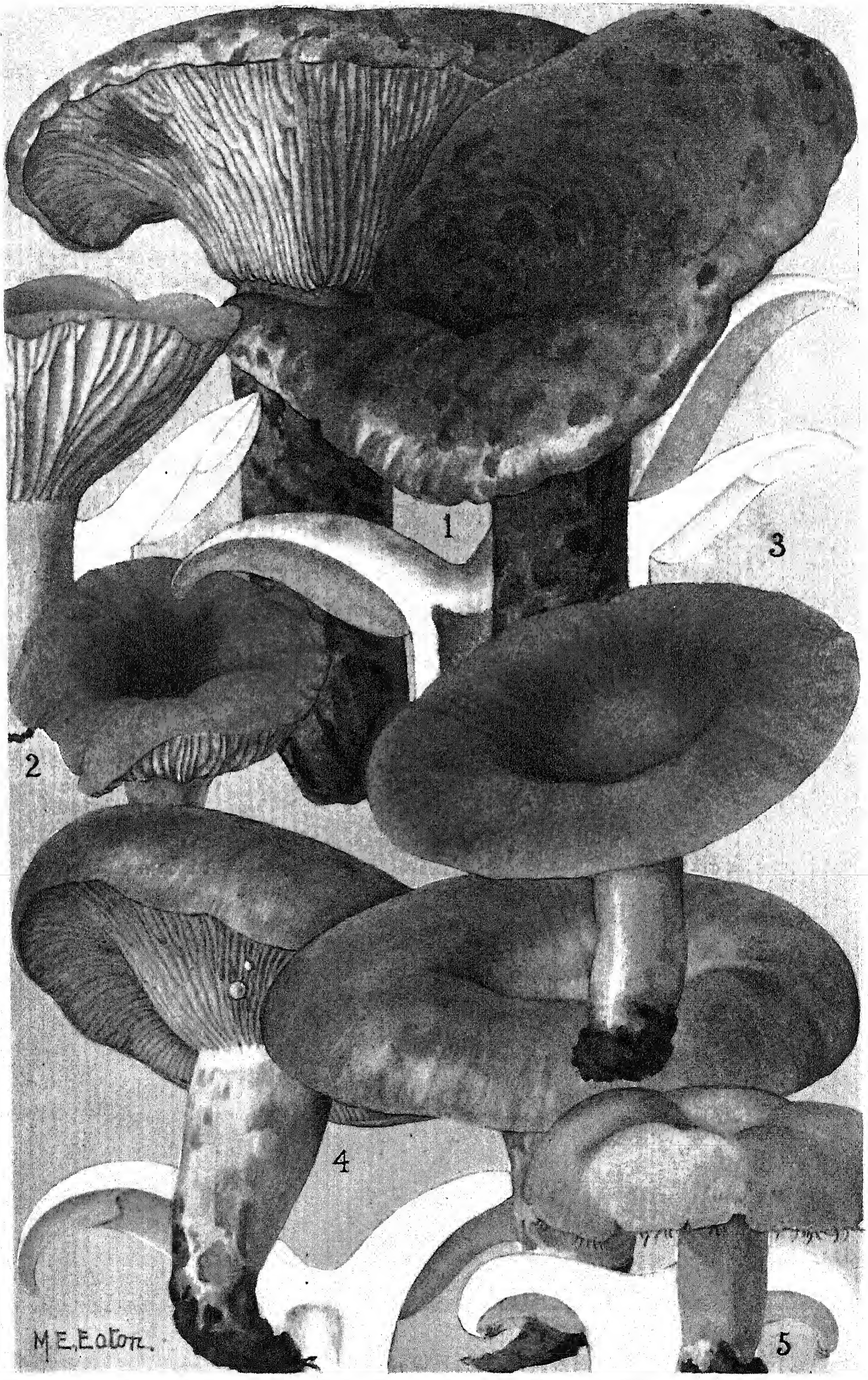
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M.E. Eaton

MYCOLOGIA

VOL. VIII JULY, 1916 No. 4

ILLUSTRATIONS OF FUNGI—XXIV

WILLIAM A. MURRILL

The species figured on the accompanying plate all belong to the genus *Lactaria,* which has been monographed, so far as the North American species are concerned, by Dr. Gertrude S. Burlingham. The drawings were made by Miss Eaton from specimens collected in or near New York City. For descriptions of the five species of *Lactaria* previously figured in this series, see *Mycologia* 3: *pl. 49,* 6: *pl. 132,* and 7: *pl. 160, 163.* The writer is indebted to Dr. Burlingham for generous assistance with this article.

Lactaria atroviridis Peck

DARK-GREEN LACTARIA

Plate 187. Figure 1. × 1

Pileus fleshy, nearly plane, soon depressed at the center, 6–10 cm. broad; surface olivaceous, azonate, dry, scabrous-hairy, sometimes cracking into small areas, margin involute, at length spreading to uplifted; context compact, white; latex white, staining the lamellae green after some time, acrid; lamellae whitish, becoming mottled with green, especially where injured, sometimes forking near the stipe, crowded, adnate to slightly decurrent, rather narrow; spores creamy-white, subglobose, echinulate, 7–8 μ; stipe colored like the pileus or paler, spotted, equal, dry, glabrous, firm, soon hollow, 2–5 cm. long, 1–2 cm. thick.

Very rare in deciduous woods from New York to the District of Columbia. The specimens figured were collected by Dr. W. S.

[MYCOLOGIA for May, 1916 (8: 121–190), was issued May 23, 1916.]

Thomas at Plandome, Long Island, September 15, 1912. The color of fresh specimens somewhat resembles that of *Russula virescens,* but the surface is darker green and both pileus and stipe are spotted, glabrous to the unaided eye, reticulate-appressed-fibrillose under a lens. The lamellae are white, becoming olivaceous in spots; the latex at first mild, slowly becoming decidedly acrid.

Lactaria hygrophoroides Berk. & Curt.

Lactaria distans Peck

DISTANT-GILLED LACTARIA

Plate 187. Figure 2. × 1

Pileus fleshy, convex, then plane, depressed at the center, sometimes becoming infundibuliform, 4–10 cm. broad; surface yellowish-buff, bistre, or fulvous, azonate, dry, very minutely pruinose-velvety, appearing as though pulverulent, sometimes rugose, sometimes rimose-areolate; margin involute, then spreading or uplifted; context firm, whitish, odorless, edible; latex white, unchanging, not staining the flesh or lamellae brownish, mild; lamellae whitish to cream-colored or yellowish-buff, not discoloring where injured, not forking, distant, sometimes connected by rugose elevations, adnate to slightly decurrent, about 3 mm. broad; spores white, globose to broadly ellipsoid, minutely echinulate, 8–10 μ in diameter; stipe of the same color as the pileus, nearly equal, glabrous, sometimes pruinose, stuffed and firm, 2–5 cm. long, 0.5–1.5 cm. thick.

On the ground in mixed woods throughout most of the eastern United States, but not so abundant as *Lactaria lactiflua,* which it much resembles. Its bright colors, velvety surface, distant gills, and lack of odor should distinguish it. The flesh is of good flavor and edible; the latex white, unchanging, mild, and very abundant. *Lactaria luteola* and *Lactaria subvelutina* are other closely related species. The poisonous *Lactaria rufa* is bay-red to rufous and very acrid.

Lactaria testacea sp. nov.

PALE-BRICK-COLORED LACTARIA

Plate 187. Figure 3. × 1

Pileus convex to expanded, deeply depressed at the center, solitary, 7 cm. broad; surface distinctly viscid, glabrous, smooth,

slightly zonate, testaceous to ferruginous-orange; context rather thin, white, somewhat acrid; lamellae narrow, adnexed, many times inserted, of medium distance, cream-colored; latex not obtained, either from context or lamellae, but the latter became stained as though a latex were present; spores subglobose to broadly ellipsoid, echinulate, hyaline, 7–9 μ long; stipe subcylindric, glabrous, smooth, white, suffused with dark-cremeous stains, solid, white within, 4 cm. long, 14 mm. thick.

Type collected on the ground in deciduous woods near the New York Botanical Garden in September, 1911, by W. A. Murrill. Not found since.

Lactaria maculosa sp. nov.

MILD-FLAVORED SPOTTED LACTARIA

Plate 187. Figure 4. × 1

Pileus convex to subexpanded, decidedly depressed at the center, reaching 10 cm. broad; surface smooth, glabrous, somewhat viscid, blotched or spotted, avellaneous-isabelline; context rather thick, white, unchanging, mild; lamellae adnate, arcuate, narrow, inserted, crowded, dull-whitish to rosy-isabelline; latex white, becoming slightly yellow on exposure, perfectly mild; spores globose or subglobose, strongly echinulate, hyaline, 8–10 μ in diameter; stipe short, sharply tapering downward, similar to the pileus in color and surface markings but with more white intermixed, hollow, white within, except at the base, where it is lilac-tinted, 5 cm. long, 2 cm. thick.

Type collected on the ground in woods near the New York Botanical Garden, September 7, 1911, by W. A. Murrill. Found only once. In general appearance this species resembles *Lactaria maculata,* but the latex of the latter is acrid and unpleasant.

Lactaria torminosa (Schaeff.) Pers.

WOOLLY LACTARIA

Plate 187. Figure 5. × 1

Pileus fleshy, convex, depressed at the center, finally nearly infundibuliform, 4–10 cm. broad; surface pale-pinkish-yellow or pale-ochroleucous or ochraceous tinged with incarnate, often zoned with deeper color, sometimes nearly white and azonate, viscid when wet, glabrous at the center; margin involute at first, then merely deflexed, persistently covered with long, white tomen-

tum; context firm, white, not changing color, poisonous; latex white, unchanging, very acrid; lamellae whitish or cream-yellow tinged with pale-incarnate, some forking near the stipe, crowded, decurrent, thin, 5 mm. broad; spores hyaline, broadly ellipsoid, echinulate, uniguttulate, $8–10 \times 6–8\,\mu$; stipe paler than the pileus, sometimes faintly spotted with yellow, equal or tapering downward, glabrous or pruinose, smooth, stuffed, becoming hollow, 3–7 cm. long, 2 cm. or less thick.

Not uncommon in deciduous or coniferous woods from Maine to Alabama and west to Colorado. The specimens figured are rather small, but they serve to illustrate the chief characters of the species, which should be readily recognized by its persistently woolly margin and very acrid taste. It differs from *L. cilicioides* in being azonate with tomentose disk and white to flesh-colored tinged with fuscous. In the raw state, this species causes painful gastro-intestinal disturbance in man, but the poison is said to be destroyed by heating. Ford has studied its action on animals and has demonstrated that it can produce an acute intoxication with only a few of the characteristic muscarin symptoms.

NEW YORK BOTANICAL GARDEN.

PHOTOGRAPHS AND DESCRIPTIONS OF CUP-FUNGI—III. PEZIZA DOMICILIANA AND PEZIZA REPANDA

Fred J. Seaver

(With Plates 188 and 189, Containing 4 Figures)

The above species of fungi, on account of their superficial resemblance, have been frequently confused. Indeed there might be some difference of opinion as to whether the two represent different species or only forms of the same species whose differences are due entirely to the difference of habitat.

Peziza domiciliana was originally described by Cooke from specimens found growing on the walls, ceilings, and floors of a house which had been partly destroyed by fire. The specific name is a very appropriate one, since, from our own observations, the species usually occurs about the cellars of houses and in caves.

The species was first encountered by the writer in Iowa, where it was found growing in the basement of one of the college buildings at Iowa Wesleyan University. There it grew on piles of damp coal-dust which had been left over from the winter's supply. The plants were described and illustrated in Iowa Discomycetes under the name of *Peziza repanda* Pers.

The species was next found in the basement of the museum building of the New York Botanical Garden where the ground was kept moist by the drip from an ice-box. The plants grew on sandy or gravelly soil, as indicated by the particles adhering to the base of the apothecia.

On March 10, 1914, the writer received still other specimens from Mr. Carl A. Schwarze, of the New Jersey Agricultural Experiment Station. These plants, which were found growing in the sand of a cutting bench in one of the greenhouses, were accompanied by the following description: "First of all the plants were gregarious, had a short but distinct stem, cups concave, nearly white and translucent when young, a yellowish-brown

when old, later becoming repand and umbelicate, and more or less angular. The stem is obscured by the expanding disc. The largest disc became convex and measured at least 10 cm."

In April of the same year, similar specimens were collected by Mr. L. O. Overholts in a mushroom cellar in Missouri. These specimens, which were referred to the writer, were accompanied by the following description: "Cups 3–8 cm. broad, somewhat stipitate, margin involute, depressed in the center, hymenium smooth, ochraceous-buff (Ridgw.) or somewhat more brownish, exterior covered with white meal."

All of the American specimens referred to above agree well with specimens of *Peziza domiciliana* from the herbarium of Cooke, so far as we can judge from dried specimens. According to Cooke, the apothecia are sessile, although in our American specimens they are, at least when young, short-stipitate. Also we have not noted any of the violet tints referred to by Cooke, although in his original description he allows for a rather liberal range of color. The spore measurements of the American and European specimens are identical. The young plants are always pure-white and usually the flesh when broken turns golden-yellow. This fact was noted by Bresadola and was found to be true of specimens collected in New York. Whether this character is constant, we are unable to say, since no attention was given to this in some of the plants when fresh. From the studies which have been made, the writer feels safe in referring our American plants to *Peziza domiciliana* Cooke, and also in regarding this species as distinct from *Peziza repanda* Pers.

Peziza repanda was described by Persoon, the original description being accompanied by an excellent colored figure. Although the species was originally reported on the ground by Persoon, subsequent authors have usually reported them on rotten logs. Whether Persoon's species actually grew on soil which was unmixed with wood it is impossible to determine, although it is not difficult to believe that the species might grow on either. Aside from this incident, Persoon's description and illustration fits the plants which are usually referred to this name. The following descriptions and illustrations will give a fair idea of our conception of the two species.

PEZIZA DOMICILIANA Cooke, Gardener's Chronicle **41**: 793. 1877

?*Octospora varia* Hedw. Descr. **2**: 22. 1788.

Peziza Adae Sadler; Cooke, Trans. Bot. Soc.. Edinburgh, **13**: 45. 1877.

Peziza odorata Peck, Bull. Torrey Club **23**: 420. 1896.

Peziza varia f. *typica* Bres. Fungi Trid. **2**: 75. 1898.

Apothecia gregarious or occasionally cespitose, usually short-stipitate when young, at first concave, soon becoming repand, leaving a depression in the center, at first rounded, becoming irregular and often decidedly angular, externally white, the margin entire or occasionally splitting, reaching a diameter of 10 cm., the substance when broken often turning golden-yellow; hymenium at first concave, becoming plane or convex and distinctly umbilicate, at first white, becoming dingy buff or brownish; stem not exceeding 1 cm. in length, thick, irregular, white, becoming obsolete with age; asci cylindric or subcylindric, reaching a length of 225 or 250 μ and a diameter of 15 μ; spores ellipsoid, hyaline when young, often containing two small oil-drops, $13–15 \times 8–10$ μ; paraphyses slender, septate, slightly enlarged above.

In cellars, mushroom-caves, and occasionally in greenhouses, usually growing on plaster, sand, gravel and coal-dust.

TYPE LOCALITY: Europe.

DISTRIBUTION: New York to Iowa and Missouri.

ILLUSTRATION: Trans. Bot. Soc. Edinburgh **13**: *pl. 3, f. a–i;* Cooke, Mycographia, *pl. 97, f. 349;* Bres. Fungi Trid. *pl. 188;* Bull. Lab. Nat. Hist. State Univ. Iowa **6**: *pl. 15, f. 2* (as *Peziza repanda* Pers.).

PEZIZA REPANDA Pers. Ic. Pict. Fung. 49. 1806

Peziza pallidula Cooke & Peck; Cooke, Bull. Buffalo Acad. Sci. **2**: 288. 1875.

Peziza repanda amplispora Cooke & Peck; Cooke, Bull. Buffalo Acad. Sci. **2**: 288. 1875.

Peziza amplispora Cooke, Mycographia 167. 1877.

Aleuria repanda Gill. Champ. Fr. Discom. 43. 1879.

Peziza Stevensoniana Ellis; Rehm Ascom. Lojk. 3. 1882.

Geopyxis pallidula Sacc. Syll. Fung. **8**: 70. 1889.

Geopyxis amplispora Sacc. Syll. Fung. **8**: 71. 1889.
Discina repanda Sacc. Syll. Fung. **8**: 100. 1889.
Plicaria repanda Rehm; Rab. Krypt.-Fl. 1^3: 1007. 1896.
Pustularia Stevensoniana Rehm; Rab. Krypt.-Fl. 1^3: 1019. 1896.
Peziza varia f. *lignicola* Bres. Fungi Trid. **2**: 76. 1898.

Apothecia sessile or very short-stipitate, at first cup-shaped, the margin even or crenate, externally white or whitish, expanding and becoming repand, the margin remaining entire or splitting, regular in outline or irregularly revolute, reaching a diameter of 8–10 cm.; stem short, stout, usually only a few mm. long or entirely wanting: hymenium concave, becoming plane or convex, pale-brown, becoming darker with age, even or convolute; asci cylindric or subcylindric, reaching a length of 225 μ and a diameter of 12–15 μ; spores ellipsoid, hyaline, smooth, 14–16 $\times$ 8–10 μ; paraphyses slender, slightly enlarged above, yellowish or brownish.

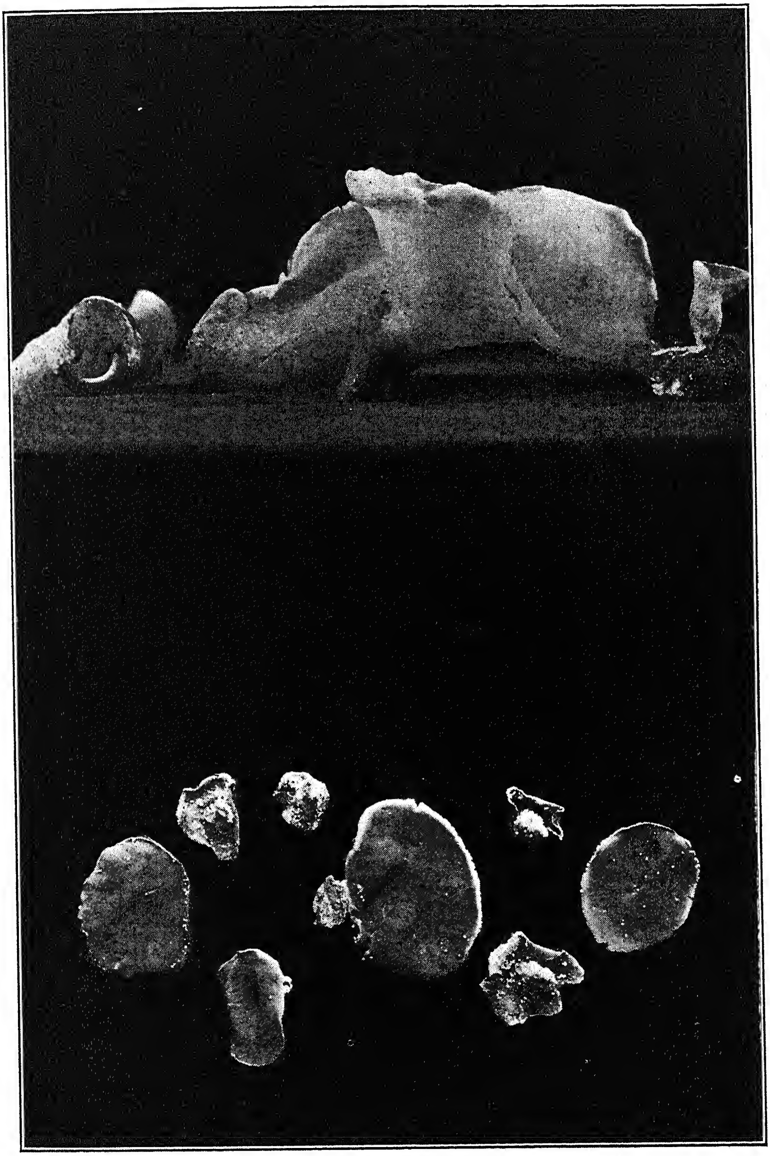
On rotten logs or occasionally on soil or chip piles.

TYPE LOCALITY: Europe.

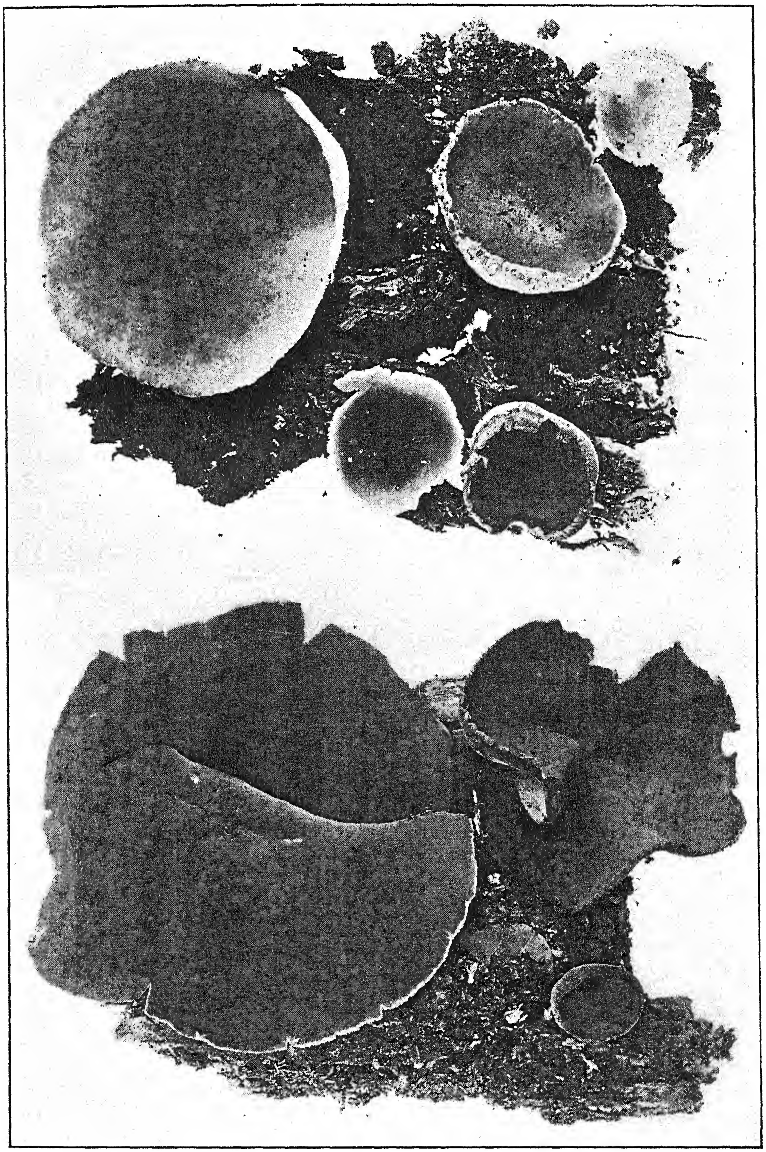
DISTRIBUTION: New York to Iowa and Maryland; also in Europe.

ILLUSTRATION: Pers. Ic. Pict. Fung. *pl. 20, f. 2*; Cooke, Mycographia *pl. 62, f. 240*; Bres. Fungi Trid. *pl. 189*; Minn. Bot. Studies 4: *pl. 15*; Minn. Pl. Diseases *f. 64*.

NEW YORK BOTANICAL GARDEN.



PEZIZA DOMICILIANA COOKE



PEZIZA REPANDA Pers.

NOTES ON THE MYXOMYCETES OF THE CURTIS HERBARIUM

William C. Sturgis

The Curtis Herbarium possesses a unique interest for American taxonomists by reason of the fact that very many of the specimens are almost certainly co-types of species published by Berkeley. The only element of uncertainty in this respect is the rather remote possibility that more than one species may have been present in the same original gathering; but in the case of the *Myxomycetes* this is so remote as to be practically negligible, and we may feel certain that in examining the specimens of this group in the Curtis Herbarium we are dealing in many cases with material used by Berkeley in describing his species. Some of the specimens appear to be now in better condition than the corresponding material in the Berkeley herbarium at Kew. In the Curtis collection the specimens show only too plain evidence of having been brushed over, at some time, with an alcoholic solution of corrosive sublimate, and Miss Lister informs me that the same is true of the Berkeley specimens. Notwithstanding this treatment, however, most of the specimens are still fairly recognizable, and although Miss Lister's observations on the material at Kew and in the British Museum are of the utmost possible accuracy, a carefully annotated examination of the corresponding material in America may not come amiss to future students. This is the more desirable in that every examination entails a certain degree of loss of material, and though this loss may be partly compensated for by the preparation of permanent microscopic mounts, most observers, lacking any careful notes on the minute details of a specimen, prefer to secure such details for themselves from the actual specimen rather than to depend altogether upon a microscopic mount. Hence the depletion gradually proceeds to the vanishing point—a deplorable result where valuable type-material is concerned.

Through the courtesy of Dr. W. G. Farlow, I have been per-

mitted during the past eighteen months to spend as much time as seemed necessary upon a most careful study of every specimen of the *Myxomycetes* in the Curtis herbarium. The following notes are the result. As will be seen, most of the specimens referred to are of species published under the authority of Berkeley, Curtis, or Ravenel either separately or in collaboration. Of the 125 species contained in the collection, 39 come under this head. There are, however, a dozen or more Schweinitzian species represented by specimens from the Schweinitz herbarium, and therefore of special interest. In recording these notes, I have followed the order in which the specimens occur in the Curtis herbarium as at present arranged. The labels and such notes thereon as are of value, I have copied precisely as they stand, except that in certain cases where Curtis has transcribed the name incorrectly, I have used the correct form.

"DIDYMIUM CHRYSOPEPLUM B. & C. (1202) ad fol: dej: madida. June. Society Hill, S. C."

Through a clerical error Curtis writes "*chrysoseplon.*" The specimen is in wretched condition, but the white, calcareous stalk, small conical columella, and the "peridio globoso, exteriore furfuracea fulvo" of the original description, are characters applicable only to *Physarum melleum* (B. & Br.) Mass. The spores in the Curtis specimen are pale brown, almost smooth, 7.3–8.4 μ diam.

"226. DIDYMIUM COLUMBINUM B. & C. Venezuela coll. Fendler."

This name was never published by Berkeley; but Rostafinski (Monog., App., p. 13) refers to this Venezuelan specimen and calls it *Tilmadoche columbina* (Berk.). Miss Lister states (*in litt.* 6/21, '15) that she has no doubt that this specimen is *Physarum compactum* (Wing.), basing her judgment on the very slender capillitium and the absence of a columella. Of the Curtis specimen little remains except a number of white stalks with chalky fracture, and the remnants of a delicate, persistent capillitium with small rounded lime-knots; the violet-brown spores are minutely and irregularly spinulose and measure 8.5–10.5 μ diam. Under the circumstances, the absence of a central ball of lime in

the remnants of the capillitium is easily explained, and the reference of the specimen to *P. compactum* seems fully justified. Such being the case, however, it is evident that the name *Physarum columbinum* (Rost.) takes precedence of *Physarum compactum* (Wing.).

"DIDYMIUM CURTISII Berk. (1179) ad gram: & herb: viv: in Savannis. July, 1847. Society Hill, S. C."

As stated by Lister, this is typical *Badhamia rubiginosa* (Chev.) Rost. The dark, rather strongly spinulose spores measure 10–11.5 μ diam.

"DIDYMIUM DEALBATUM B. & C. Venezuela, coll. Fendler."

This specimen is undoubtedly a portion of the type of *Chondrioderma subdictyospermum* Rost. It corresponds precisely with Rostafinski's description. The earlier name was never published.

"(3510) DIDYMIUM LUTEOGRISEUM B. & C. Penna., 1851. Dr. Michener (484)."

This specimen, together with another similarly labelled in Michener's handwriting and bearing the same number (484) are apparently co-types, although the original note on the species (Grevillea, **2**: 65, 1873) does not give the number of the specimen referred to, nor does Rostafinski in referring to the same species later. The specimen labelled by Michener himself is in fine condition and is typical *Physarum polycephalum* Schw. It is interesting to note, however, that most of the sporangia in this specimen are single and therefore are of the so-called variety *"obrusseum."*

"DIDYMIUM MEGALOSPORUM B. & C. (1205) ad folia dejecta. June. Society Hill, S. C."

The specific name appears on the label as *"megalospermum,"* but Berkeley wrote *"megalosporum."* The specimen is typical *Didymium eximium* Pk. Lister relegated this species to varietal rank under *D. nigripes* (Lk.) Fr., and applied to the variety the designation *"eximium."* This being the first name to be applied to the form after its transfer to varietal rank, it remains valid in accordance with Article 49 of the Vienna Rules of Nomenclature. If, however, *Didymium eximium* Pk. is regarded as a distinct

species, as it is by Macbride, evidently the name "*megalosporum* B. & C." takes precedence of "*eximium* Pk."

"5701 DIDYMIUM NECTRIAEFORME Berk. & Curt. fol. mort. Querc. coll. D. Murray. Mass. Sprague (828)."

This is a fairly abundant specimen of *Physarum virescens* Ditm., in good condition.

"DIDYMIUM OBRUSSEUM B. & C. ad folia. Cuba. C. Wright (799) B. & C. Fung: Cub; 532."

Two specimens are referred to under the original description (Journ. Linn. Soc., **10**: 348, 1868) i.e. Nos. 664 and 799 of Wright's Cuban Fungi, of which the first mentioned is the type. Both of these numbers are found in the Curtis herbarium, as well as the specimen collected by Lindheimer on leaves of *Gonolobus* in Texas and referred to under the second description of the species (Grevillea **2**: 53, 1873). Fortunately the co-type, No. 664, is in fairly good condition and is easily referable to *Physarum polycephalum* Schw., var. *obrusseum* (B. & C.) List. Through a clerical error on Curtis' part, the specific name on the Texas specimen appears as "*obfuscum*."

"(2987) DIDYMIUM, straw, leaves, sticks, etc., Sept. 1850. Santee Canal, S. C. Ravenel (1100)."

To this label Curtis has added the note, "D. xanthopo prox: sed floccis albis." The specimen is a co-type of *Didymium proximum* B. & C., which Berkeley differentiates from *D. xanthopus* on the ground of a difference in the color of the capillitium. It is, however, unquestionably the latter form.

"DIDYMIUM PRUINOSUM B. & C. 530. on sticks. Jan., 1857. Cuba, coll. Wright (269)."

Nothing remains of this specimen except one or two slender black stalks. The capillitium has disappeared. The few spores remaining are bright purple brown, minutely spinulose, and measure 10–11.5 μ diam. Lister refers it, doubtless correctly, to *Physarum compressum* A. & S.

"DIDYMIUM PUSILLUM B. & C. (1345) ad Herb. corrumpent. Septr. Society Hill, S. C."

The specimen shows a few crushed sporangia with delicate,

reddish stalks 0.75 mm. in height; membranous wall, venulose below; and pale brownish spores, almost smooth, and measuring 10–11.8 μ diam. Miss Lister (Monog., Ed. 2, p. 65) notes the confusion caused by the existence of two species under the one number in Berkeley's herbarium. The single specimen in the Curtis herbarium shows only *Physarum pusillum.*

"DIDYMIUM RADIATUM B. & C. ad fol. gram. Cuba. C. Wright (733). B. & C. Fung: Cub: 529."

A quantity of the circular, whitish bases of stalks and two or three stalks filled with crystalline nodules of white lime are all that is left of this specimen. Miss Lister refers it to *Didymium squamulosum* (A. & S.) Fr.

"DIDYMIUM RAVENELII B. & C. Aest. 1852. Sulphur Springs, N. C. Ravenel (1513)."

The few perfect sporangia show stout, brown or black stalks; a capillitium of delicate threads with pale, reddish, fusiform lime-knots; and pale violet-brown spores, very minutely spinulose and measuring 8.5–9.5 μ. diam. It is evidently a faded specimen of *Physarum pulcherripes* Pk. I have elsewhere discussed the relationships and the synonymy of this species,[1] but the conclusion therein stated that the specific name *Ravenelii* might be retained was a mistaken one, since the name given by Peck antedates the other by three months. That name was written "*pulcherripes,*" and the original orthography should be retained. In connection with this species it is interesting to note the range of color exhibited in species of the "*P. globuliferum*" group, including the red of "*pulcherripes,*" the brown of "*murinum,*" the purple of "*pulcherrimum.*" I have recently seen specimens collected by Mr. Hugo Bilgram, of Philadelphia, which are of a pinkish lilac color, and Professor Macbride has collected a pale blue form. In all of these the distinctions are based practically on color alone.

"DIDYMIUM TENERRIMUM B. & C. 533. "grayish." fol. Tillandsia etc. June 1857. Cuba. Coll. Wright (267)."

This is a co-type of *Physarum polycephalum* Schw. var. *obrusseum* (B. & C.) List.

[1] Transac. Conn. Acad. A. & S. Vol. X, Pt. 2, p. 468–470, 1900.

"6364 DIDYMIUM TERRIGENUM B. & C. ad terram argillaceam nudam. Julio. 1857. Hillsborough, N. C."

This very scanty and weathered specimen consists of a membranous hypothallus on which, originally, were seated closely crowded sporangia, now reduced to the remains of a capillitium consisting of rounded or angular, pale yellow lime-knots, connected by abundant slender threads. The spores are violet- or umber-brown, almost smooth, and measure 7.5–8 μ diam. Lister appears to me to have been correct in referring this to *Physarum virescens* Ditm. (Monog., Ed. 1, p. 60) rather than to *P. lateritium* as is done in Ed. 2 of the same work.

"ENTERIDIUM CINEREUM Schw. insuper putridas herbas effusum. Bethl. Herb. Schw. = ejus Lachnobolus."

"LACHNOBOLUS CINEREUS Schw. insuper stipites dejectos. Bethl. Herb. Schw. = ejus Enteridium."

Both of these specimens are typical *Fuligo cinerea* (Schw.) Morg.

"SPUMARIA LICHENIFORMIS Schw. cort. trunc. dejec. Robiniae. Bethl. Herb. Schw."

This is typical *Physarum didermoides* (Ach.) Rost.

"PHYSARUM CAESPITOSUM Schw. Herb. Schw."

Many years ago I wrote in reference to this species: "So far as I know, there is no authentic specimen in existence."[2] This specimen in the Curtis herbarium, however, must be considered as at least authentic. Unfortunately, practically nothing remains of it except traces of a thin, membranous, pale straw-colored hypothallus, and, mingled with these, numbers of spores of a pale umber color, very minutely and irregularly punctate and measuring 8–9.5 μ diam. These spores seem to me a sufficiently distinguishing feature so far as the connection of this species with *Physarum citrinellum* Pk., is concerned. They are certainly not the spores of the latter species. I can therefore only repeat, though with more assurance, my previous statement (*l. c.*) that *Physarum caespitosum* Schw. is identical with *P. virescens* Ditm. There is nothing in Schweinitz's original description which mili-

[2] Transac. Conn. Acad. A. & S. Vol. X, Pt. 2, p. 472, 1900.

tates against this view, and the character of the spores in the specimen under consideration supports it.

"(5191) PHYSARUM CHRYSOTRICHUM B. & C. lign. putr. Aut. 1854 Ala. Peters (704)."

The label reads "chrysostictum," evidently a clerical error. In the original description of the species (Grevillea, 2: 66. 1873) the specimen number is given as 5091, but in Curtis' original MS. list it is 5191. Lister's reference of this species to *Badhamia decipiens* (Curt.) Berk. seems based on fairly sufficient evidence. The Curtis specimen shows nothing but the basal portions of a number of sessile, golden-yellow sporangia and a few violet-brown, minutely spinulose spores, 11 μ in diameter, or slightly smaller.

"PHYSARUM CUPRIPES B. & R. Ravenel (1645) & Peters (1157)."

Again by an error, the label reads "*cupriceps*." Both specimens are in wretched condition. The single sporangium found shows a very delicate capillitium with scanty and small, yellowish lime-knots, and violet-brown spores, almost smooth, and measuring 8 μ diam. A very fine specimen is to be found in Ravenel's Fung. Car. Exsicc., Fasc. III, No. 76, under the name *P. cupriceps* Berk. & Rav. Both Lister and Macbride correctly refer this species to *Physarum flavicomum* Berk.

"(6072) PHYSARUM PETERSII B. & C. Ala. superiore, Peters (982)."

This specimen, referable to *P. pulcherripes* Pk., is in comparatively good condition, though the sporangia are crushed down upon the soft substratum. Careful treatment exhibits a columella not peg-like, such as is usually seen in the "*globuliferum*" group, but varying from broadly conical to subglobose and giving rise to the columella from all parts of its surface, very much as in *Didymium nigripes* (Lk.) Fr. var. *eximium* (Pk.) List. The specimen of *P. pulcherripes* distributed in Ellis & Everhart, N. A. F., No. 3300, shows the same form of columella, and even in the case of typical *P. globuliferum* (Ell. & Ev., N. A. F., No. 1120) the columellae are large and columnar, measuring 0.8–1.5 mm. in

height and 0.3–0.5 mm. in thickness. In both specimens of *P. pulcherripes* above referred to, the stalks are slender and bulging with globular, red masses of plasmodic material, 18 μ in diameter, largely replacing the usual lime.

"PHYSARUM VERMICULARE Schw. Salem. Herb. Schw."

This is a fairly good specimen of typical *Perichaena vermicularis* (Schw.) Rost.

"(1972) DIDERMA PALLIDUM B. & C. Pine leaves and straw on the ground. Aug. 1848. Santee Canal, S. C. Ravenel (788)."

Berkeley (Grevillea, 2: 52, 1873) referred this specimen to "*Angioridium valvatum* Fr.," a combination which apparently never existed. What Fries wrote (Index Syst. Myc., p. 51) was "*Angioridium sinuosum* Gr. (*Diderm. valvat.*? *Phys. sin.*?)." Berkeley (*l. c.*) also wrote "*Diderma pallidum* B. & C." in connection with this specimen, but since he added no description, both names are *nomina nuda,* and *Physarum bogoriense* Racib. takes precedence. Moreover, the specimen numbered 1972 in the Berkeley herbarium differs essentially from the common *Angioridium sinuosum* of Greville, according to Miss Lister (Monog., Ed. 2, p. 78). The scanty remains of the corresponding specimen in the Curtis herbarium throw no further light on the subject except in so far as the pale violet-brown, almost smooth spores, measuring 9–10 μ diam., differ from those of *P. sinuosum.*

"PHYSARUM DECIPIENS B. & C. (1333) ad Trunc. Querc. viv. Aug: Sept. Society Hill; S. C."

This is a comparatively fine specimen consisting of a number of globose or elongated sporangia, 0.5 mm. in diam., sessile, rugose, reddish-orange; capillitium of yellow branching lime-knots with no connecting threads; spores free, pale umber, minutely spinulose, 13–15 μ diam. It is, of course, *Badhamia decipiens* (Curt.) Berk.

"BADHAMIA PAPAVERACEA CORT: Quercus. Aiken, S. C. Ravenel (1768)."

This specimen is a co-type and, though somewhat scanty, shows admirably the characters distinguishing it from *B. capsulifera,* i. e., the short, stout, brown stalks on which the sporangia are borne

either singly or in pairs, and the spore-clusters consisting of only about 8 or 9 spores.

"(3578) TRICAMPHORA OBLONGA B. & C. Penn[a] 1851. Dr. Michener (407)."

This is a fine co-type, consisting of about eight sporangia, well preserved and perfectly characteristic.

"OPHIOTHECA PALLIDA B. & C. Fung. Cub. 544. (413) Herbis mucidis. July, Hillsborough, N. C."

The label bears this name written in pencil, in Curtis' handwriting, over the name *Trichia serpula* Pers. Berkeley twice refers to this specimen (413), and each time as the type of a separate species, first under *Ophiotheca pallida* (Journ. Linn. Soc. **10**: 350, 1868), and again under *O. umbrina* (Grevillea **2**: 68, 1873). It is a well-preserved and perfectly characteristic specimen of *Perichaena vermicularis* (Schw.) Rost.

"B. & C. Fung. Cub. 544 OPHIOTHECA WRIGHTII B. & C. dead wood, Cuba, C. Wright (673)."

This is a fine specimen of *Perichaena chrysosperma* (Curr.) List.

"(2991) CRATERIUM MINIMUM B. & C. in quisquiliis. Aug. 1850. Santee Canal, S. C. Ravenel (1055)."

Miss Lister (Monog., Ed. 2, p. 96) refers this to "var. *cylindricum*" of *Craterium leucocephalum* (Pers.) Ditm. Macbride considers it a distinct species. The designation "cylyndricum (Mass.)" being the first to be applied to this form as a variety, remains valid; but Macbride, regarding the form as of specific rank, rightly retains the original specific name, "*minimum* B. & C." A careful examination of the specimen under consideration reveals no points of difference between it and typical *C. leucocephalum,* except the smaller and somewhat more cylindrical sporangia of the former. I should hardly regard these differences as more than varietal.

"CRATERIUM PORPHYRIUM Schw., Herb. Schw."

Of this specimen there remain only traces of a dark purple-red hypothallus; a reddish capillitium marked with indistinct spirals,

minutely spinulose and with many free, pointed ends; and pale reddish spores. It is unquestionably *Hemitrichia Vesparium* (Batsch) Macbr.

"STEMONITIS DIGITATA Schw. Herb. Schw."

Except for the fasciculate habit, there is nothing to distinguish this specimen from *Arcyria cinerea* (Bull.) Pers.

"STEMONITIS MAXIMA Schw. Herb. Schw."

The marked difference of opinion between the leading students of Myxomycetes as to the characteristic features of *Stemonitis fusca* Roth are due, of course, to the loss of that specific type. Rostafinski describes what he considers as Roth's species and states that the spores are smooth. Macbride accepts this *dictum,* and therefore applies the name *S. fusca* (Roth) Rost. to fuscous forms having smooth or slightly warted spores. To similar forms having reticulated spores he applies the name *S. maxima* Schw. Lister, however, after examining the specimens established by Rostafinski as *S. fusca* Roth, pronounces the spores to be not smooth, as stated by Rostfinski, but delicately reticulated. It seems difficult, therefore, to escape the conclusion that forms showing reticulated spores should be placed in the "*fusca*" group. It is here that *S. maxima* Schw. belongs. The specimen in Herb. Curtis consists of a few crushed and weathered sporangia about 10 mm. in height; surface net reddish, small-meshed, meshes angular, 6–15 μ diam.; spores pale smoky brown, closely and faintly reticulate, 7 μ diam.

"(1967) STEMONITIS PORPHYRA B. & C. ad lign. muscos. Pini. Maio 1849. Santee Canal, S. C. Ravenel (744)."

Miss Lister (Monog., Ed. 2, p. 165) refers this species doubtfully to *Lamproderma columbinum* (Pers.) Rost., for which reference the original description (Grevillea 2: 69, 1873) certainly gives some grounds. The specimen, however, is a very different thing. Though in poor condition, it shows a number of brittle, calcareous, purple stalks, 0.9 mm. long and 0.08–0.09 mm. thick, and a capillitium of the "*globuliferum*" type, but with small reddish purple lime-knots; the spores are very pale reddish, smooth, and measure 7.8 μ diam. This is evidently *Physarum*

pulcherrimum B. & R. Unfortunately the original description quotes no herbarium-number, so that it is impossible to determine what specimen is the type. Berkeley merely writes (*l. c.*) "on pine wood"; Curtis' MS. list says, under No. 1967, "lign: putr. Pini"; the Curtis specimen is on coniferous wood. Through the kindness of Miss A. L. Smith, of the British Museum, I am assured that of four Ravenel specimens in the Museum herbarium, all numbered 744, three were originally labelled *Stemonitis porphyra* B. & C., which name is crossed out and *Physarum pulcherrimum* B. & R. substituted, while the fourth bears only the latter name. Ravenel's No. 77 in Fung. Car. Exsicc., Fasc. II, is labelled *Physarum pulcherrimum* B. & R.; the index to the same fascicle gives *Stemonitis porphyra* B. & R., over which is pasted a label bearing the same name as the specimen. From these facts there would seem to be little doubt but that "*Stemonitis porphyra* B. & C." is *Physarum pulcherrimum* B. & R., and that one of these Ravenel specimens served Berkeley as a type notwithstanding the fact that the authority for the former name is given as "*B. & C.*" and not "*B. & R.*"

"STEMONITIS TENERRIMA M. A. C. (1343) Ad Herb: corrump. Sept. Society Hill, S. C."

From this very scanty specimen a single sporangium is narrowly cylindrical and tapering in shape, 1.7 mm. high; stalk, 0.4 mm. long; spores pale brownish, very minutely punctate, 5.8–7.2 μ diam. It is *Comatricha pulchella* (Ch. Bab.) Rost.

"STEMONITIS TRECHISPORA B. & C. Venezuela. Coll. Fendler."

I recently took occasion[3] to state my reasons for accepting, as applied to this specimen, Rostafinski's designation, "*dictyospora*," whether the form were of specific or merely varietal rank. Since that time, however, Miss Lister has kindly called my attention to the fact that this is a case similar to those cited above (*Didymium columbinum* and *D. megalosporum*), in which Article 49 of the Vienna Rules is applicable. Lister first reduced the banded-spored forms to varietal rank under *S. fusca* Roth, and applied to them the name "*trechispora*." That name, therefore, is to be accepted as the proper varietal designation. In case,

[3] MYCOLOGIA **8**: 38. 1916.

however, these banded-spored forms are considered as of specific rank, they should bear the name *Stemonitis dictyspora* Rost. The specimen before us represents the extreme limit of departure from typical *Stemonitis fusca,* the sooty-black sporangia showing hardly a trace of any surface net and the large, dark spores, measuring 11.5–13.5 μ diam. and being marked with a network of raised bands, which form a distinct border to the spore when seen in profile.

"(2992) CRIBRARIA ELEGANS B. & C. ad. lign. putr. Aug: 1855. Santee Canal, S. C. Ravenel (1044)."

This specimen agrees perfectly with the published descriptions of the species.

"(2717) CRIBRARIA MINIMA B. & C. Pine boards after rain. Julio 1849. Society Hill, S. C."

The label reads "*Cribraria microscopica,*" but the number is the one referred to in Grevillea 2 : 67 as the basis for the description of *C. minima*. The specimen is typical *C. minutissima* Schw., though very scanty.

"(1182) CRIBRARIA MICROSCOPICA B. & C. Underside of old shingles and on old rails of pine. July 1847. Society Hill, S. C. Yellow."

This specimen is in even worse condition than the preceding. The most diligent search fails to reveal a single sporangium. The published description applies to *C. minutissima.*

"ARCYRIA BICOLOR B. & C. ad ram: deject: Cuba. C. Wright. B. & C. Fung: Cub: 542."

This is in poor condition, but is distinctly referable to the "*digitata*" form of *Arcyria cinerea.*

"ARCYRIA GLOBOSA Schw. Herb. Schw."

Though a very scanty specimen, enough remains to show the distinctive features of the species.

"ARCYRIA MINOR Schw. Herb. Schw."

Miss Lister (Monog., Ed. 2, p. 242) refers this doubtfully to *Arcyria incarnata* Pers. The specimen before us shows a capillitium free from the cup, and marked with a very open spiral of

blunt ridges—characters which appear to confirm Miss Lister's opinion.

"ARCYRIA PALLIDA B. & C. ad lign: putridum. Aug. 1848. Society Hill, S. C."

This is undoubtedly *A. cinerea* (Bull.) Pers., though of a yellower color than usual.

"CRATERIUM FLORIFORME Schw. Herb. Schw."

Berkeley (Grevillea 2: 67) writes "*C. floriforme* Schwein. is a *Trichia*." Miss Lister includes it under *Hemitrichia Vesparium*, though doubtfully. The free, rarely branching, dark red elaters terminating in a long point, the solid stalk, and the orange spores 11 μ diam., place it distinctly under *Trichia Botrytis* Pers. var. *lateritia* (Lév.) List.

"LICEA ARTOCREAS B. & R. Cort: Juniperi. Martio 1850. Ravenel (1459)."

This name is attached to the specimen No. 82 in Ravenel's Fung. Car. Exsicc., Fasc. II, but the combination was never published. When Berkeley described the species, he placed it under the genus *Perichaena*, where it belongs (Grevillea 2: 68, 1873). It is typical *P. depressa* Lib. Berkeley's description of the spores as "fusiform" is due to the fact that they are shrunken. Proper treatment readily restores them to their normal form.

"PERICHAENA IRREGULARIS B. & C. subter ram. dej. putrid. Jan. 1848. Society Hill, S. C. (2478)."

This again is typical *P. depressa* Lib.

"(6081) LICEA APPLANATA B. subter ram. Querc. alba. 1856. Ala. superiore. Peters (1009)."

Two descriptions of this species were published by Berkeley, the second of which (Grevillea 2: 68, 1873) cites this specimen. It is normal *Dictydiaethalium plumbeum* (Schum.) Rost., except that the corner-strands measure nearly 7 μ diam. and are greatly thickened along the outer edge. This causes the strands to coil up like a spring when detached. A similar feature characterizes a specimen collected by Professor Roland Thaxter in Chile.

"LICEA MACROSPORA Schw. in peponibus putridis. Herb. Schw."

An examination of this specimen confirms Miss Lister's reference of the species to *Didymium difforme* (Pers.) Duby.

"LICEA MICROSPERMA B. & C. (4695) in trunc. cavo. Aug. 1853. Nova Cesarea: Laning (56)."

Through a clerical error the label reads "*microscopica*." Miss Lister refers the species to *Tubifera ferruginosa* (Batsch) Gmel., but the stipitate habit and the smaller spores (4.3–4.7 μ diam.) bring it plainly under *T. stipitata* (B. & R.) Macbr.

"LICEA RUBIFORMIS Berk. & Curt. Japan U. S. Pac. Ex. Ex. (315)."

This is a poorly developed specimen of *Tubifera ferruginosa* (Batsch) Gmel.

"LICEA SPERMOIDES B. & C. (4867) ad fol. deject. putresc. Alabama: Beaumont (349)."

This specimen is certainly referable to var. *simplex* of *Lindbladia effusa* (Ehr.) Rost. rather than to *Cribraria argillacea* Pers. (cf. Lister, Monog., Ed. 2, p. 175).

"LICEA STIPITATA B. & R."

The herbarium contains three specimens under this name, labelled respectively:

I. "Rotten logs. Oct. 1854. Bonin. U. S. Pac. Ex. Ex. (314)."

II. "Ad lign. cariosum. Cuba. C. Wright (678). B. & C. Fung: Cub. 551."

III. "Autumno. Santee Canal. H. W. Ravenel (1305)."

These specimens correspond respectively with three published descriptions, i. e.:

I. Berkeley & Curtis, Proc. Am. Acad. Arts & Sc., **4**: 125, 1858.

II. Berkeley, Journ. Linn. Soc., **10**: 350, 1868.

III. Berkeley, Grevillea, **2**: 68, 1873.

The Cuban specimen is so crushed as not to show the true habit, but the others are typical in this respect and all are characterized by small spores (4.7–5 μ diam.).

"OSTRACODERMA SPADICEUM Schw. ram. dej. Mori albae. Herb. Schw."

This name appears to have been overlooked by the monographers. It was published in Syn. Fung. Am. Bor., p. 262, 1831. The specimen is normal *Dictydiaethalium plumbeum* (Schum.) Rost.

From the above notes it will be seen that my observations are, in most cases, merely corrobrative of those recorded by the Listers. The few instances in which I have been obliged to dissent from their opinion or in which further study has resulted in changes in the hitherto accepted synonomy, are as follows:

Didymium columbinum B. & C.
Tilmadoche columbina Rost. } = *Physarum columbinum* (Rost.) Sturgis. Syn. *P. compactum* (Wing.) List.

Didymium megalosporum B. & C. (*ut. var.*) = *Didymium nigripes* (Lk.) Fr. var. *eximium* (Pk.) List.

Didymium terrigenum B. & C. = *Physarum virescens* Ditm.

Lachnobolus cinereus Schw. = *Fuligo cinerea* (Schw.) Morg.

Craterium minimum B. & C. (*ut. var.*) = *Craterium leucocephalum* (Pers.) Ditm. var. *cylindricum* (Mass.) List.

Stemonitis porphyra B. & C. = *Physarum pulcherrimum* B. & R.

Craterium floriforme Schw. = *Trichia Botrytis* Pers. var. *lateritia* (Lév.) List.

Stemonitis trechispora B. & C. (*ut. sp.*) = *Stemonitis dictyospora* Rost.

Stemonitis trechispora B. & C. (*ut. var.*) = *Stemonitis fusca* Roth. var. *trechispora* (B. & C.) List.

Licea microsperma B. & C. = *Tubifera stipitata* (B. & R.) Macbr.

Ostracoderma spadiceum Schw. = *Dictydiaethalium plumbeum* (Schum.) Rost.

UNIVERSITY MUSEUM,
CAMBRIDGE, MASSACHUSETTS.

BASIDIOMYCETES COLLECTED IN INDO-CHINA BY C. B. ROBINSON[1]

Paul W. Graff

This small collection of Basidiomycetes was made by Dr. C. B. Robinson, of the Bureau of Science, Manila, while on a short vacation trip of fifteen days to Nha-trang, Annam, Indo-China. All the specimens were collected near the town of Nha-trang, between March 11 and 26, 1911. The collection was merely an incidental one and no attempt was made to gather other fungous specimens than those which conspicuously presented themselves; hence the smallness of the number. These specimens are in the herbarium of the Bureau of Science, Manila. As one might suppose from the casual collecting, only fairly common material was obtained. The value, therefore, of the collection is not in the citation of new material but in extending the range of forms already known.

Fomes Fries

Fomes rimosus (Berk.) Fr. Nov. Symb. Myc. (1851) 66

Polyporus rimosus Berk. Hook. Lond. Journ. Bot. 4 (1845) 54.

Polyporus ignarius Fr. var. *scaber* Berk. Ann. Nat. Hist. 3 (1839) 324.

Robinson 1489.

Reported from Guiana, South Africa, and the Philippines.

Polystictus Fries

Polystictus bogoriensis (Holterm.) Sacc. & Syd. ex Sacc. Syll. Fung. 16 (1902) 157

Polyporus bogoriensis Holterm. Mykol. Unters. aus den Tropen (1898), 94, *pl. 9, fig. 1–8.*

Robinson 1417.

[1] Contribution from the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, Philippine Islands.

Originally described from Javan material. Collected also in the Philippines.

POLYSTICTUS FLOCCOSUS (Jungh.) Fr. Epicr. Myc. (1836) 480

Polyporus floccosus Jungh. Flor. Crypt. Java (1838) 49.
Trametes acutus Cooke, Grevillea **10** (1882) 32.
Polystictus acutus Sacc. Syll. Fung. **6** (1888) 243.
Robinson 1458.

Previously reported from the island of Java, Australia, and the Philippines.

POLYSTICTUS MEYENII (Klotz.) Cooke, Grevillea **14** (1885) 79

Polyporus meyenii Klotz. Nov. Act. Acad. Nat. Cur. 19 (1843) Suppl. 236.
Robinson 1417a.

The species was originally described from Philippine material collected by Meyen in 1831. This collection extends its habitat to the Asiatic coast.

POLYSTICTUS SANGUINEUS (L.) Fr. Nov. Symb. Myc. (1851) 75

Boletus sanguineus L. Sp. Plant. Ed. 2 (1762) 1646.
Xylometron sanguineum (L.) Paul. Icon. Champ. (1793), *pl. 3, fig. 3, 4.*
Agaricus ruber Lamk. Encyc. Meth. Bot. **1** (1783) 50.
Polyporus sanguineus (L.) Mey. Flor. Esseq. (1818) 304.
Polyporus flaccidus Pers. ex Gaud. Bot. Freyc. Voy. Uranie (1826) 160.
Polyporus ampliporus Fr. Elench. Fung. **1** (1828) 99.
Polyporus argentatus Cooke, Grevillea **15** (1886) 20.
Pycnoporus sanguineus (L.) Murr. Bull. Torr. Bot. Club **31** (1904) 421.
Robinson 1286.

This species is of universal distribution throughout the tropics and one of the most common. It is very probable that it and *Polystictus cinnabarinus* (Jacq.) Fr., which is of as common distribution in the temperate zones, are but forms of the same species.

POLYSTICTUS XANTHOPUS Fr. Nov. Symb. Myc. (1851) 74

Polyporus xanthopus Fr. Obs. Myc. 2 (1815–1818) 255; Syst. Myc. 1 (1821) 505.

Boletus katui Ehrenb. ex Nees Hor. Phys. Ber. (1820) 93, *pl. 19, fig. 12.*

Polystictus saccatus Pers. ex Gaud. Bot. Freyc. Voy. Uranie (1826) 169, *pl. 1, fig. 3.*

Polystictus cupro-nitens Kalchbr. Thüm. Myc. Univ. n. 1702.

Polystictus crassipes Curr. Flor. Pug. p. 122.

Robinson 1388.

A species of very general tropical distribution. One of the species belonging to the *Polystictus perula* group, which also includes such related species as *P. affinis, P. flabelliformis, P. luteus, P. nepholodes, P. pterygodes,* etc., all commonly found in the Asiatic tropics and the Pacific islands.

DAEDALEA Pers.

DAEDALEA FLAVIDA Lév. Ann. Sci. Nat. Bot. III, 2 (1844) 198

Polyporus lenziteus Lév. ex Zoll. Vers. (1854) 17.

Robinson 1405a.

The spores of the specimens of this collection are slightly smaller than those of the same species collected in the Philippines. Otherwise, however, the material from both localities appears to be identical. The fungus was first described from material collected in Borneo by Korthals.

The species has, till now, only been reported from the two localities, Borneo and the Philippines.

DAEDALEA PALISOTI Fr. Syst. Myc. 2 (1821) 335

Daedalea amanitoides Beauv. Fl. Owar. 1 (1804) 44, *pl. 25.*

Daedalea repanda Pers. ex Gaud. Bot. Freyc. Voy. Uranie (1826) 168.

Daedalea applanata Kl. Linnaea 8 (1833) 481.

Lenzites palisoti Fr. Epicr. Myc. (1838) 404.

Lenzites repanda Fr. in l. c.

Lenzites applanata Fr. in l. c.

Daedalea indica Jungh. Flor. Crypt. Java (1838) 74.
Lenzites pallida Berk. Lond. Journ. Bot. 1 (1842) 146.
Lenzites platypoda Lév. Ann. Sci. Nat. Bot. III, 2 (1844) 180.

Robinson 1405.

This species is of very general tropical distribution.

DAEDALEA LURIDA Lév. Ann. Sci. Nat. Bot. III, 2 (1844) 198

Daedalea subconfragosa Murr. Bull. Torr. Bot. Club 35 (1908) 415.

Robinson 1421.

Robinson's collection has been compared with co-type material of *D. subconfragosa* with which it agrees perfectly and they are undoubtedly identical with Léveillé's species from Java.

Java and the Philippines seems to be the limit of distribution as yet published.

HEXAGONIA Fries

HEXAGONIA TENUIS (Hook.) Fr. Epicrisis (1836) 498

Boletus tenuis Hook. ex Knuth, Syn. Plant. (1822–1825) 10.
Boletus reticulatus Hook. in *l. c.*, page 9.
Polyporus tenuis Kl. Linnaea 8 (1833) 482.

Robinson 1487.

Previously reported from Central America, Natal, Mauritius, India, and Malacca.

LENTINUS Fries

LENTINUS EXILIS Klotz. ex Fr. Syn. Lent. (1836) 10; Fr. Epicr. Myc. (1836) 393

Robinson 1420.

Basidia cylindrical 6.5 by 33.0 μ, sterigmata slightly curved 3.3 μ, spores 2.2 to 2.6 by 6.6 μ, cylindrical to sausage shaped, hyaline.

A species of probably general tropical distribution. Known from Cuba, Australia, Mauritius, Ceylon, and the Philippines.

MOUNT VERNON, N. Y.

PLEUROTUS, OMPHALIA, MYCENA, AND COLLYBIA PUBLISHED IN NORTH AMERICAN FLORA

William A. Murrill

Volume 9, part 5, of *North American Flora,* by William A. Murrill, appeared June 7, 1916, with descriptions of the following genera and species:

Genera	Total Species	New Species
Lentodiellum	1	
Geopetalum	22	5
Crepidopus	9	
Micromphale	8	2
Leptomyces	5	
Omphalopsis	32	14
Galactopus	4	
Prunulus	106	52
Omphalina	31	15
Gymnopus	93	45
	311	133

Those preferring currently accepted generic names may use the following new combinations proposed for their benefit:

Geopetalum geophilum	= **Pleurotus geophilus**
Geopetalum albescens	= **Pleurotus albescens**
Geopetalum subelatinum	= **Pleurotus subelatinus**
Geopetalum subhaedinum	= **Pleurotus subhaedinus**
Geopetalum tremelliforme	= **Pleurotus tremelliformis**
Gymnopus agricola	= **Collybia agricola**
Gymnopus avellaneigriseus	= **Collybia avellaneigrisea**
Gymnopus avellaneidiscus	= **Collybia avellaneidisca**
Gymnopus badiialbus	= **Collybia badiialba**
Gymnopus cinchonensis	= **Collybia cinchonensis**
Gymnopus cremeimelleus	= **Collybia cremeimellea**
Gymnopus densifolius	= **Collybia densifolia**
Gymnopus dentatus	= **Collybia dentata**
Gymnopus denticulatus	= **Collybia denticulata**
Gymnopus domesticus	= **Collybia domestica**
Gymnopus Earleae	= **Collybia Earleae**
Gymnopus Eatonae	= **Collybia Eatonae**
Gymnopus farinaceus	= **Collybia farinacea**

Gymnopus fimetarius	= Collybia fimetaria
Gymnopus flavescens	= Collybia flavescens
Gymnopus fulvidiscus	= Collybia fulvidisca
Gymnopus fulvipes	= Collybia fulvipes
Gymnopus Glatfelteri	= Collybia Glatfelteri
Gymnopus griseifolius	= Collybia griseifolia
Gymnopus jamaicensis	= Collybia jamaicensis
Gymnopus ludovicianus	= Collybia ludoviciana
Gymnopus marasmiiformis	= Collybia marasmiiformis
Gymnopus monticola	= Collybia monticola
Gymnopus musicola	= Collybia musicola
Gymnopus nigritiformis	= Collybia nigritiformis
Gymnopus oculatus	= Collybia oculata
Gymnopus orizabensis	= Collybia orizabensis
Gymnopus pallidus	= Collybia pallida
Gymnopus roseilividus	= Collybia roseilivida
Gymnopus setulosus	= Collybia setulosa
Gymnopus sinuatus	= Collybia sinuata
Gymnopus squamiger	= Collybia squamiger
Gymnopus subavellaneus	= Collybia subavellanea
Gymnopus subflavescens	= Collybia subflavescens
Gymnopus subflavifolius	= Collybia subflavifolia
Gymnopus sublatericius	= Collybia sublatericia
Gymnopus subnivulosus	= Collybia subnivulosa
Gymnopus subrugosus	= Collybia subrugosa
Gymnopus tenuifolius	= Collybia tenuifolia
Gymnopus tortipes	= Collybia tortipes
Gymnopus trullisatus	= Collybia trullisata
Gymnopus unakensis	= Collybia unakensis
Gymnopus virginianus	= Collybia virginiana
Gymnopus Volkertii	= Collybia Volkertii
Gymnopus xuchilensis	= Collybia xuchilensis
Micromphale badium	= Pleurotus badius
Micromphale fulvifibrillosum	= Pleurotus fulvifibrillosus
Micromphale subexcavatum	= Pleurotus subexcavatus
Omphalina acuminata	= Omphalia acuminata
Omphalina coccinea	= Omphalia coccinea
Omphalina collybiiformis	= Omphalia collybiiformis
Omphalina cremea	= Omphalia cremea
Omphalina cuspidatella	= Omphalia cuspidatella
Omphalina Dawsonii	= Omphalia Dawsonii
Omphalina Earlei	= Omphalia Earlei
Omphalina hypobrunnea	= Omphalia hypobrunnea
Omphalina incarnata	= Omphalia incarnata
Omphalina jalapensis	= Omphalia jalapensis
Omphalina lenta	= Omphalia lenta
Omphalina luteicolor	= Omphalia luteicolor
Omphalina miniata	= Omphalia miniata
Omphalina niveicolor	= Omphalia niveicolor

OMPHALINA SEQUOIARUM	= Omphalia Sequoiarum
OMPHALINA SUBCARTILAGINEA	= Omphalia subcartilaginea
OMPHALINA SUBSCYPHOIDES	= Omphalia subscyphoides
OMPHALINA TEPEITENSIS	= Omphalia tepeitensis
OMPHALOPSIS BAKERI	= Omphalia Bakeri
OMPHALOPSIS CALIFORNIENSIS	= Omphalia californiensis
OMPHALOPSIS CONVEXA	= Omphalia convexa
OMPHALOPSIS CUTICOLOR	= Omphalia cuticolor
OMPHALOPSIS DISTANTIFOLIA	= Omphalia distantifolia
OMPHALOPSIS MCMURPHYI	= Omphalia McMurphyi
OMPHALOPSIS MYCENIFORMIS	= Omphalia myceniformis
OMPHALOPSIS PETASIFORMIS	= Omphalia petasiformis
OMPHALOPSIS PRAEDECURRENS	= Omphalia praedecurrens
OMPHALOPSIS PSEUDOGRISEA	= Omphalia pseudogrisea
OMPHALOPSIS RORIDULIFORMIS	= Omphalia roriduliformis
OMPHALOPSIS SUBAVELLANEA	= Omphalia subavellanea
OMPHALOPSIS SUBIMMACULATA	= Omphalia subimmaculata
OMPHALOPSIS TRANSLUCENTIPES	= Omphalia translucentipes
OMPHALOPSIS TURBINATA	= Omphalia turbinata
PRUNULUS ABRAMSII	= Mycena Abramsii
PRUNULUS ADIRONDACKENSIS	= Mycena adirondackensis
PRUNULUS ALCALINIFORMIS	= Mycena alcaliniformis
PRUNULUS ARGILLACEUS	= Mycena argillacea
PRUNULUS ATRIBRUNNEUS	= Mycena atribrunnea
PRUNULUS ATRIDISCUS	= Mycena atridisca
PRUNULUS AURANTIACUS	= Mycena aurantiaca
PRUNULUS AURANTIIDISCUS	= Mycena aurantiidisca
PRUNULUS AVELLANEIGRISEUS	= Mycena avellaneigrisea
PRUNULUS AVELLANEUS	= Mycena avellanea
PRUNULUS BREVIPES	= Mycena brevipes
PRUNULUS CAESIIALBUS	= Mycena caesiialba
PRUNULUS CARBONICOLA	= Mycena carbonicola
PRUNULUS CERVINIALBUS	= Mycena cervinialba
PRUNULUS CINCHONENSIS	= Mycena cinchonensis
PRUNULUS CINEREIAVELLANEUS	= Mycena cinereiavellanea
PRUNULUS COLLYBIIFORMIS	= Mycena collybiiformis
PRUNULUS FARINACEUS	= Mycena farinacea
PRUNULUS FLAVICITRINUS	= Mycena flavicitrina
PRUNULUS FULIGINOSUS	= Mycena fuliginosa
PRUNULUS FUMOSIAVELLANEUS	= Mycena fumosiavellanea
PRUNULUS FUSIPES	= Mycena fusipes
PRUNULUS GRACILLIPES	= Mycena gracillipes
PRUNULUS GRANTII	= Mycena Grantii
PRUNULUS LATERICIUS	= Mycena latericia
PRUNULUS LEPIOTIFORMIS	= Mycena lepiotiformis
PRUNULUS LEUCOPHAEUS	= Mycena leucophaea
PRUNULUS LONGIPES	= Mycena longipes
PRUNULUS LUDOVICIANUS	= Mycena ludoviciana
PRUNULUS MAGNUS	= Mycena magna
PRUNULUS MARGARITA	= Mycena margarita

PRUNULUS MELLEIDISCUS = Mycena melleidisca
PRUNULUS MINUTISSIMUS = Mycena minutissima
PRUNULUS MURINUS = Mycena murina
PRUNULUS MYCELIOSUS = Mycena myceliosa
PRUNULUS NIVEIPES = Mycena niveipes
PRUNULUS OCCIDENTALIS = Mycena occidentalis
PRUNULUS OCHRACEICINEREUS = Mycena ochraceicinerea
PRUNULUS PALUDICOLA = Mycena paludicola
PRUNULUS PARVULUS = Mycena parvula
PRUNULUS PECTINATUS = Mycena pectinata
PRUNULUS PLUMBEIBRUNNEUS = Mycena plumbeibrunnea
PRUNULUS PUBESCENS = Mycena pubescens
PRUNULUS ROSEIPALLENS = Mycena roseipallens
PRUNULUS ROSEOLUS = Mycena roseola
PRUNULUS RUTILANTIFORMIS = Mycena rutilantiformis
PRUNULUS SABALI = Mycena Sabali
PRUNULUS SCABRIPES = Mycena scabripes
PRUNULUS SUBFUMOSUS = Mycena subfumosa
PRUNULUS SUBPULVERULENTUS = Mycena subpulverulenta
PRUNULUS SUBTENUIPES = Mycena subtenuipes
PRUNULUS SYRINGEUS = Mycena syringea
PRUNULUS TENUICULUS = Mycena tenuicula
PRUNULUS TESTACEUS = Mycena testacea
PRUNULUS TROJANUS = Mycena trojana
PRUNULUS VIRIDIGRISEUS = Mycena viridigrisea

NEW YORK BOTANICAL GARDEN.

NOTES AND BRIEF ARTICLES

Dr. Heinrich Rehm, of Munich, the world's greatest authority on Ascomycetes, died on April 1 in his eighty-eighth year.

In the Punjab hills in India, where the practice of lopping is prevalent, a serious outbreak of *Trametes Pini* has occurred which is causing severe loss in the case of *Pinus excelsa* in particular. More resistant species are recommended, as well as mixed plantings.

In the February number of the *Journal of Agricultural Research,* H. S. Jackson reports the presence of an Asiatic species of *Gymnosporangium, G. koreaense,* in Oregon. The telial stage occurs on *Juniperus chinensis* and the pycnia and aecia on various Pomaceae.

Professor George M. Reed, of the department of botany of the University of Missouri, has been appointed research fellow at the Brooklyn Botanic Garden for the summers of 1916 and 1917, in place of Professor W. H. Rankin, of Cornell University, who has undertaken an investigation of the white-pine blister rust in New York State. The problem to be investigated is the diseases of trees and shrubs of Prospect Park.

Forest pathology in forest regulation is discussed by E. P. Meinecke in Bulletin 275 of the Bureau of Plant Industry at Washington, with the white fir as the chief example. The author is now at work upon the pathology of other important western timber trees.

Professor H. H. Whetzel, of Cornell University, spent May 5–13 at the Garden working over the large and important collection of rusts and other parasitic fungi obtained by him and Dr. Olive in Porto Rico during the past winter. Professor Arthur

paid the Garden a flying visit to examine some of the rusts in this collection.

Dr. Arthur Harmount Graves, formerly Assistant Professor of Botany in the Sheffield Scientific School of Yale University, and Instructor in Forest Botany in the Yale Forest School, has been appointed Associate Professor of Biology in the new Connecticut College for Women, at New London, Connecticut. Dr. Graves will have charge of the instruction in botany, beginning work next September.

A disfiguring and rotting disease of mangoes caused by *Bacillus Mangiferae* is described as having appeared in South Africa in recent years. The infection is carried partly by water dripping from affected portions of the plant, but a more important carrier is found in air movements. Lignified tissues are not affected, but the organism invades parenchymatous tissues, wedging apart and killing the cells and causing dark, angular spots on the leaves. Other soft portions of the plant are also attacked. Sprays seem to have no effect.

Dr. Thomas J. Burrill, who has been connected with the University of Illinois since 1868, died April 14, in his seventy-eighth year. He was born in Pittsfield, Massachusetts, and, after being graduated from the Illinois State Normal University in 1865, later received honorary degrees from Northwestern University and the University of Chicago. Dr. Burrill was formerly professor of natural history, botany, and horticulture at the Unisity of Illinois, from which he retired as professor emeritus in 1912. For many years he was vice-president, and for four years acting president of the University of Illinois.

The Prickly-Pear Traveling Commission of Australia came to the conclusion that disease does not play any important part anywhere in checking the growth of prickly pear when growing under normal conditions. Only one organism, *Gloeosporium lunatum,* is regarded as of sufficient value to warrant its introduction. This is common in Texas and on warm, moist days causes rapid

and considerable destruction of young segments and of older joints if previously attacked. Another fungus, *Sclerotium Opuntiarum,* causes a disease which is somewhat serious in Argentina.

Bulletin 371 of the New York Agricultural Experiment Station contains a description of the cause and control of the leaf blotch of horse chestnut. The disease causes the leaves to turn brown and die. It is so destructive to young seedlings that it is difficult to grow the trees from seeds and consequently most of the trees are imported, adding greatly to the expense. The disease is caused by the fungus known as *Guignardia Aesculi.* The destruction of the old leaves will do much to retard the fungus, although this is not sufficient to check it entirely. Dusting with a mixture of sulfur and arsenate of lead is a very effective means of controlling the fungus, the dusting being considered preferable to treatment with liquid spray.

"Edible and Poisonous Mushrooms," by W. A. Murrill, appeared June 26, 1916. This work consists of a large colored chart and a handbook containing descriptions of the chief edible and poisonous species in North America, together with a discussion of edible and poisonous fungi in general and methods of preparing and cooking mushrooms. The treatment is brief, requiring only about seventy-five pages, but it covers the ground in a practical and safe way and will enable the intelligent mushroom-loving public to enjoy many of our native wild species without fear of unpleasant consequences. The author has erred rather on the side of safety, failing to figure and recommend for food the royal agaric, the blushing amanita, the sheathed amanitopsis, and many other species which are excellent and often eaten.

The chart was prepared under the author's direction by a very careful artist and is suitable for hanging on the wall in libraries and schools, as well as in botanical museums. Different backgrounds are used for the edible and poisonous species, which are separated and plainly labeled so that no mistakes can occur. The maximum of safety lies in accurate figures and descriptions not only of species that may be safely eaten but also of all the dangerous species that should be avoided.

Professor A. H. R. Buller in his article on "The Fungus Lore of the Greeks and Romans," reprinted from the *Transactions of the British Mycological Society,* recalls and discusses a number of very interesting matters connected with edible and poisonous fungi and the dawn of mycology proper. For example, the first known illustration of a fungus is said to be one of *Lactarius deliciosus,* preserved in a mural decoration at Pompeii; the *Boletus* of Pliny and other Latin authors was really *Amanita Caesarea;* the Romans obtained fire by rubbing two pieces of wood together and lighting tinder obtained from *Fomes fomentarius;* and the stone fungi of the ancients were probably simple corals with radiating plates resembling mushroom gills.

After discussing at some length the fungi known to the ancients, the author concludes, as follows: "We have now come to an end of this first chapter in the history of Mycology. We have seen that the Greeks and Romans were familiar with a good many kinds of edible and poisonous fungi, that the Romans in particular developed elaborate recipes for cooking the most desirable species, that means were taken for dealing with cases of accidental poisoning, and that certain fungi had been discovered to possess medicinal properties. On the other hand, so far as the origin and mode of reproduction of fungi are concerned, the ancients were in complete ignorance. In general, they were contented to accept a theory of spontaneous generation, and they never even suspected that fungus fruit-bodies are simply reproductive organs. The spore dust, except doubtless in the Puffballs, appears to have entirely escaped observation."

A KNOWN SPECIES OF SMUT ON A NEW HOST[1]

In March, 1916, Mr. Paul C. Standley collected at Fort Myers, Florida, a smut on *Cyperus Gatesii* Torr., which produces similar symptoms and has the same mycological characters as *Cintractia leucoderma* (Berk.) P. Henn. The smut just mentioned has been described as attacking several species of *Rynchospora* and has been collected in Florida on at least two of these. It is to be noted that *Rynchospora* is a genus of the Cyperaceae and therefore related closely to *Cyperus.*

[1] Published by permission of the Secretary of the Smithsonian Institution.

According to Clinton[2] the sori of this fungus surround peduncles, pedicels, bases of rachises, and sometimes stems. On Cyperus, however, the sori are mostly found surrounding portions of the stems and sometimes running up on the leaf sheaths. They measure 1 to 4 cm. in length and when young are covered with a white fungal membrane which flakes away at maturity and reveals a dark agglutinated spore mass. The spores are dark-brown and verruculose, and have the form of spheres which have been compressed or concaved on one side; they thus appear to be spherical, subspherical, reniform, or irregular, depending on the side from which they are seen. Their larger diameter measures 16 to 20 microns and the compressed diameter 8 to 12 microns. These characters agree with those given by Clinton for *Cintractia leucoderma.*

H. R. ROSEN.

[2] North Am. Fl. 7: 35–36. 1906.

INDEX TO AMERICAN MYCOLOGICAL LITERATURE

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Trametes pini.

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M E Eaton

MYCOLOGIA

Vol. VIII SEPTEMBER, 1916 No. 5

ILLUSTRATIONS OF FUNGI—XXV

WILLIAM A. MURRILL

Several species of the genus *Venenarius,* formerly called *Amanita,* were figured in MYCOLOGIA 5: *pl. 87.* The accompanying plate shows additional varieties of the deadly amanita and another species which is quite rare. The drawings were made by Miss Eaton from specimens collected in or near New York City.

Venenarius solitarius (Bull.) Murrill

Amanita solitaria Fries

WARTED AMANITA PINE-CONE AMANITA

Plate 190. Figure 1. × 1

Pileus subglobose or convex, to plane, solitary, 5–20 cm. broad; surface dry, usually white or slightly yellowing, rarely cinereous or murinous, densely pulverulent, or pelliculose adorned with seceding, angular warts that may be soft, floccose, and flattened, or firm and erect, often becoming glabrous with age, margin smooth, at times appendiculate; context firm, white usually of mawkish flavor and odor resembling that of chlorin; lamellae usually adnexed and rather narrow, occasionally free and rounded behind, more or less crowded, white; spores ellipsoid, smooth, hyaline, very variable in size, $7–14 \times 5–9\,\mu$; stipe subequal, usually radicate, bulbous or enlarged or equal below, concolorous or paler, mealy above, squamulose or imbricate-squamose below, solid or slightly spongy, 4–15 cm. long, 1–4 cm. thick; annulus white, apical, fragile or lacerate, often appendiculate or evanescent; volva white, usually friable, rarely remaining as concentric, margined scales or a short limb at the base of the stipe.

[MYCOLOGIA for July (8: 191–230) was issued July 15, 1916.]

An exceedingly variable species, usually white and scaly and often with a chlorin odor, occurring in the open or in thin woods throughout most of the United States. It has been considered edible, but Ford finds that it contains a small quantity of the deadly amanita-toxin found in *Venenarius phalloides* and it should therefore never be eaten. The variety here figured is one of the rarest forms assumed by this species in America, representing *Agaricus echinocephalus* Vitt. and *Agaricus onustus* Howe.

Venenarius glabriceps (Peck) Murrill

SMOOTH-CAPPED AMANITA

Plate 190. Figure 2. × 1

Pileus thin, ovoid, becoming broadly convex or centrally depressed, 5–10 cm. broad; surface glabrous, viscid when moist, rarely adorned when young with a few patches of the ruptured volva, white or yellowish-white, sometimes slightly brownish at the center, margin usually finely striate; context white; lamellae thin, crowded, free, unequal, white; spores globose, smooth, hyaline, 7.5 μ; stipe long, slender, stuffed, glabrous or floccose-squamulose, white, bulbous at the base, 7.5–15 cm. long, 6–12 mm. thick; annulus thin, white, sometimes appendiculate or evanescent; volva adnate, marginate, definitely circumscissile.

This rare and elegant species occurs among fallen leaves in woods in New York state. The surface is usually glabrous from the first, as in white and yellow forms of *V. phalloides*. Peck says his *Amanita phalloides striatula* is a small variety of this species.

Vaginata albocreata (Atk.) Murrill

Amanitopsis albocreata Atk.

WHITE-BOOTED VAGINATA

Plate 190. Figure 3. × 1

Pileus convex to expanded, 5–8 cm. broad; surface viscid, with floccose volval patches which usually mostly disappear with age, white with yellow center, or at times entirely pale-yellow, margin finely striate and minutely tuberculate; context thin, white; lamellae free or slightly adnexed, rounded in front, narrowed behind, floccose on the edges; spores globose, smooth, hyaline, 7–10 μ; stipe cylindric or slightly tapering upward, abruptly bulbous, minutely floccose or farinose, white, hollow, 10–13 cm. long, 6–12

mm. thick; bulb ocreate, with limb narrow, as in *V. pantherinus,* and sometimes very slight; volval patches may occur in concentric lines on the lower part of the stipe.

Rare in open grassy places or thin woods from New York to Alabama. This species very much resembles *Venenarius glabriceps,* but is without an annulus. The volva is white and fits the base of the stipe closely like a stocking. Peck called this species *A. nivalis.*

Lepiota aspera (Pers.) Quél.

SPINY LEPIOTA

Plate 190. Figure 4. × 1

Pileus fleshy, hemispheric to convex and expanded, obtuse, at times depauperate, usually 7–12 cm. broad; surface appressed-tomentose, pale-ferruginous, decorated, especially near the center, with brown, compact, sometimes pointed, wart-like, separable scales; context moderately thick, white or yellowish; lamellae rather narrow, closely crowded, sometimes forked, white or yellowish, tapering behind, free, approximate; spores $5–10 \times 2–4\,\mu$; stipe thick, tapering upward from the bulbous base, fistulose or fibrous-stuffed, white and pruinose above the annulus, tomentose or fibrillose-scaly and ferruginous below, usually 8–12 cm. long, 8–12 mm. thick at the apex, and 18–25 mm. thick at the base; veil usually large, white, membranous, persistent, adherent in places to the margin of the pileus and annulate upon the stipe, at times reduced and fibrillose.

A rather frequent species in rich soil or humus in shaded places throughout most of the United States, and known under several names, such as *Lepiota acutesquamosa, L. Friesii, L. asperula,* and *L. eriophora.* It varies considerably in size and in the character of the spines, which are often reduced to mere wart-like, readily separable scales.

Venenarius phalloides (Fries) Murrill

Amanita phalloides Quél.

DEADLY AMANITA DESTROYING ANGEL

Plate 190. Figure 5. × 1

Pileus convex or campanulate to expanded, 3–15 cm. broad; surface smooth, slightly viscid when moist, glabrous or decorated with scattered patches of the volva, varying in color from pure-white to yellow, yellowish-green, green, gray, brown, or blackish,

margin rarely striate; context extremely poisonous, white, not objectionable to the taste but having at times a somewhat disagreeable odor; lamellae white, unchanging, broad, ventricose, rounded at the base and free or adnexed; spores globose, smooth, hyaline, 7–10 μ; stipe subequal, bulbous, long, smooth or floccose-scaly, usually white, stuffed or hollow, 6–15 cm. long, 0.5–1.5 cm. thick; annulus superior, membranous, thin, ample, persistent or at times becoming torn away, usually white; volva white, adnate to the base of the large, rounded bulb, the limb usually free, conspicuous, lobed, thick and fleshy, persistent, but at times breaking partly or wholly into irregular patches that are either carried up on the surface of the pileus or remain at the base of the stipe.

This most deadly species, for which no antidote is known, occurs widely distributed in many forms and colors, but is always distinguished by the presence of a distinct volva or death-cup at the base of the stipe. See Mycologia 5: *pl. 87, f. 1* for an illustration of the common white form known as the destroying angel. The brown form figured on the accompanying plate is very rare about New York City but quite common farther north, where it attains a larger size.

It is frequently stated that poisons may be removed from mushrooms by boiling them in water and throwing the water away. This may be true of some species, but it is by no means true of the deadly amanita. This species has only recently been subjected to severe tests with both dry heat and steam without disorganizing or extracting the poison from the substance of the cap.

The variety of colors assumed by this species—white, yellow, green, gray, brown, blackish—and the fact that the annulus and the limb of the volva may sometimes be lost, make it necessary to use great caution in selecting any white-gilled species with bulbous stipe for food, whether an annulus is present or not. All species of *Venenarius* and *Vaginata,* and several species of *Lepiota,* must be examined with great care.

NEW YORK BOTANICAL GARDEN.

PHOTOGRAPHS AND DESCRIPTIONS OF CUP-FUNGI—IV. PEZIZA CLYPEATA

Fred J. Seaver

(With Plate 191, Containing 2 Figures)

Among the fleshy cup-fungi, there are few which have been the subject of more confusion and misunderstanding than *Peziza clypeata* Schw. The species was originally described by Schweinitz from material collected in North Carolina.

A specimen collected October, 1883, by the late A. P. Morgan was sent to Mr. J. B. Ellis with the following note: "I enclose what I take to be *Peziza clypeata* Schw. Do you find this species? The substance is quite thick and firm; it spread out flat upon the wood; it grows on old rotten logs with a damp smooth surface." A note appended to this specimen apparently by Mr. Ellis states, —"probably = N. A. F. 568." This number had already been distributed under the name of *Psilopezia nummularia*. From this time the two species seem to have been confused.

In the "Discomycetes of the Miami Valley," Mr. Morgan[1] in referring to *Peziza clypeata* Schw. says: "I had always taken this for *Psilopezia nummularia* until I got Massee's work." In the same paper, referring to *Psilopezia nummularia*, he says: "Although the type of this species was sent from Cincinnati by Mr. Lea, I do not appear to have collected it, my specimens examined by Mr. Massee being pronounced *Peziza adnata* B. & C." Mr. Morgan, in the same paper, regarded this as a synonym of *Peziza clypeata* Schw. which it undoubtedly is, if Massee was correct in his determination of the Ohio specimen. *Peziza adnata*, a tropical plant described from Cuba, is said to have rough spores. This may be due to faulty observation, for the two species agree perfectly in other characters. At any rate, *Peziza clypeata* and *Peziza adnata* have come to be regarded as synonyms.

Although Mr. Morgan says that he had always regarded his

[1] Jour. Myc. 8: 189. 1902.

Ohio plants as *Psilopezia nummularia* Berk. until Massee's work caused him to change his mind, the letter referred to above written in 1883 by his own hand shows that he originally suspected that this was Schweinitz's plant and he was doubtless misled by the wrong determination of plants distributed by Mr. Ellis.[2] In his later paper on the "Discomycetes of the Miami Valley," it will be noted that his early suspicions were confirmed. To Mr. Morgan, therefore, probably belongs the credit of having worked out the identity of *Peziza clypeata* Schw.

In 1879, Dr. Peck redescribed this plant as *Bulgaria bicolor*. Later having apparently decided that it was not a *Bulgaria,* he transferred it to the genus *Peziza*. The specific name was untenable in this genus since it was preoccupied and the name *Peziza orbicularis* was used. I have examined the type of this species and find it identical with *Peziza clypeata*.

With the single exception of the specimen sent to Mr. Ellis in 1883, all of the plants of this species which have been studied in our collection—and the species has been collected frequently—have been called *Psilopezia nummularia* Berk, or *Peziza orbicularis* Peck. The object of the present paper is to call attention to the identity of the plant and its synonyms.

Except for a slight difference in the color of dried plants, *Psilopezia juruensis* P. Henn. does not seem to differ. Specimens of this species from South America have been examined.

The fact that these plants occur on much decayed wood renders it difficult to determine its substratum with certainty. Dr. Peck reports his plants on decaying birch. Our own appeared to be growing on decaying soft maple. In most cases the plants are reported simply on rotten wood.

While *Psilopezia nummularia* Berk. is usually regarded as a distinct species, there is enough similarity between the two to partly justify the confusion which has existed. The two are similar in spore characters and color. Both are adnate to the wood on which they grow. In *Psilopezia nummularia,* however, the plants appear to be smaller—they were originally described as one third of an inch in diameter—and always entirely adnate and surrounded by a white mycelial border. The margin

[2] North American Fungi 568

appears never to be elevated in young plants as it is in *Peziza clypeata* Schw. *Psilopezia nummularia* has not been so frequently collected and probably for this reason its characters are not so well known.

The following description of *Peziza clypeata* Schw. is based on a study of fresh plants which have been collected and studied for the past three or four seasons. Colored sketches of the plants in all stages have also been preserved. The accompanying illustrations were made from fresh plants and show both the old and young stages of development.

PEZIZA CLYPEATA Schw. Schr. Nat. Ges. Leipzig **1**: 117. 1822

Peziza adnata Berk. & Curt. Jour. Linn. Soc. **10**: 365. 1868.

Bulgaria bicolor Peck, Ann. Rep. N. Y. State Mus. **32**: 49. 1879.

Peziza orbicularis Peck, Bull. N. Y. State Mus. **2**: 20. 1887.

Discina adnata Sacc. Syll. Fung. **8**: 100. 1889.

Discina clypeata Sacc. Syll. Fung. **8**: 101. 1889.

Discina orbicularis Sacc. Syll. Fung. **8**: 103. 1889.

?*Peziza Barlaeana* Bres. Fungi Trident. **2**: 74. 1892.

Psilopezia juruensis P. Henn. Hedwigia **43**: 273. 1904.

?*Pachyella Barlaeana* Boud. Hist. Class. Discom. Eu. 50. 1907.

Psilopeziza orbicularis Dodge, Trans. Wisc. Acad. Sci. **17**: 1052. 1913.

Apothecia gregarious but not usually crowded, at first globose, gradually opening, soon becoming shallow cup-shaped, later discoid, regular in outline or occasionally more or less distorted when old, becoming closely adnate to the substratum to the extreme margin or with a narrow margin free and slightly upturned, varying in size from a few mm. when young to 3 or 4 cm. when mature; hymenium at first dark reddish brown, smooth and glistening, later assuming an olive tint and losing its luster, when old greenish-black (almost entirely black when dried), splitting in old specimens, giving rise to whitish vein-like markings, the splitting due to the unequal shrinkage of the apothecium and the substratum, substance soft, inclined to waxy; asci cylindric, reaching a diameter of 17μ, often spirally twisted when dry; spores 1-seriate, ellipsoid, smooth, hyaline, with 1 or 2 large oil-drops, $12–14 \times 25–27$, or rarely $30–33\mu$; paraphyses adhering together, septate, strongly enlarged above, reaching a diameter of 7 or 8μ, densely filled with yellowish-brown coloring matter.

On much decayed deciduous logs of various kinds which are saturated with water.

TYPE LOCALITY: North Carolina.

DISTRIBUTION: New York to Wisconsin, North Carolina and Cuba; also in South America.

ILLUSTRATIONS: Peck, Bull. N. Y. State Mus. **2**: *pl. 2, f. 4–6*; Hedwigia **43**: 273, *f. 1–3*: (?) Boud. Ic. Myc. *pl. 310*; (?) Bres. Fungi Trident, *pl. 187*.

EXSICCATI: Ellis, N. Am. Fungi *568* (as *Psilopezia nummularia* Berk.).

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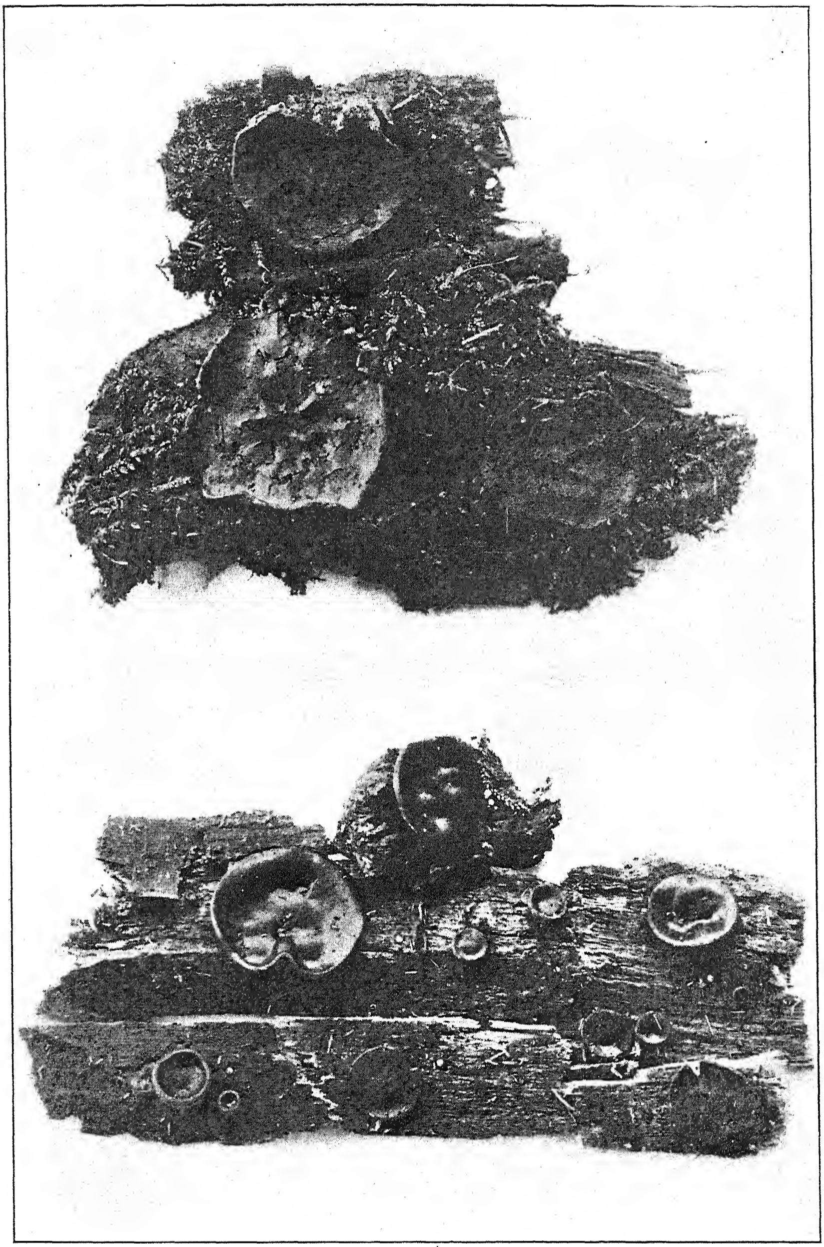


PEZIZA CLYPEATA SCHW.

A NEW SPECIES OF ENDOTHIA

Stephen C. Bruner

(With Plate 192, Containing 5 Figures)

On the grounds of the Estación Experimental Agronómica and elsewhere in the vicinity of Santiago de las Vegas, the writer has found an *Endothia* to be quite common on several species of *Eucalyptus* and on the mango (*Mangifera indica*). Microscopical and cultural studies have shown this form to be distinct from any previously described species. On *Eucalyptus,* the fungus is usually found on the bark of dead or injured trees. It is also sometimes seen on the outer layers of rough bark on large healthy trees. On mango, the fungus has been found only on dead branches lying on the ground. No perithecia have yet been obtained from this source, but in culture this form is indistinguishable from that on *Eucalyptus.* The pycnidial stage of the fungus has also been observed on the avocado (*Persea gratissima*) and the jobo (*Spondias mombin*). A specimen on the last was collected near Herradura in the province of Pinar del Rio by Dr. C. L. Shear, of the United States Department of Agriculture, and kindly presented to the writer by him. This is the only instance so far known of the occurrence of this *Endothia* on a native tree, although the fungus itself is undoubtedly of Cuban origin.

In general characters, the fungus rather closely resembles *Endothia radicalis* (Schw.) DeNot. However, the ascospores are larger and slightly different in form, and in culture the color reactions of the two are quite distinct.

Cultural Characters

Boiled rice, sterile *Eucalyptus* twigs, and potato agar were the media found most satisfactory in studying this fungus, although others were used to some extent. These were prepared according to the following formulae:

Rice. Place 3 grams of dry commercial rice and 10 cc. of dis-

tilled water in test tubes and autoclave at 115° C. for one-half hour.

Eucalyptus twigs. Select twigs of *Eucalyptus botryoides* about ¼ inch in diameter, and by alternate diagonal and transverse cuts divide into sections approximately 1½ inches long. Place with the slanted surface upward in test tubes containing 2 or 3 c.c. of distilled water. Autoclave for 15 minutes at 115° C.

Potato agar. Boil 250 grams of sliced potato in 1000 cc. of distilled water for 1 hour. Filter through cotton. Restore loss due to evaporation, etc. Add 115 grams of shredded agar; steam until thoroughly dissolved. Filter through cotton. Tube and autoclave for 15 minutes at 115° C.

All cultures were incubated under ordinary laboratory conditions, the mean temperature during the period being 21.5° C.

Cultures on Rice.—On this medium the behavior of the fungus is characterized by a rather tardy and scant production of pigment—a character which readily distinguishes it from the other known species of *Endothia* occurring in North America and the West Indies. Within three or four days after inoculation, there is a somewhat short cottony growth of mycelium over the upper surfaces of the medium. After five to seven days, small points of orange-yellow appear in places where the pycnidia are beginning to form and the older aerial mycelium changes to ivory-white or pale-buff. In about fifteen days, the rather large yellow pycnidia mature and exude moist masses or tendrils of bright-yellow or orange-colored spores. No marked submerged color changes of any kind take place, the medium merely turning to a pale-dirty-buff as growth proceeds. The aerial mycelium remains white or pale-buff and the yellow color is seen only where the pycnidia have developed. No further changes occur except that in old cultures pycnidia formed against the sides of the tubes often become dark-brown.

Cultures on Eucalyptus Twigs.—Cultures five days old show a thin web-like growth over the cut surfaces, with here and there small masses of yellowish mycelium where pycnidia are beginning to form. Two days later, a few pycnidia mature and the exudation of spore masses begins. Pycnidia continue to form on the cut surfaces and later on the bark. The surface growth re-

mains rather thin and clinging, becoming pale-buff when old. Cultures fifteen days old show numerous large pale-yellow or buff pycnidia on the cut surfaces and a smaller number scattered over the bark. These in many cases exude moist masses or tendrils of orange-yellow spores. Further changes consist mainly in the formation of additional pycnidia and a somewhat heavier growth of surface mycelium.

Cultures on Potato Agar.—Single ascospores when transferred to tubes of potato agar produce in one week hyaline growths which extend on the surface from 4 to 10 mm. from the point of inoculation. The submerged growth is somewhat less extensive. The advancing edges are irregularly denticulate and slightly undulate in outline, and the surface presents a gently contoured, somewhat fluted appearance. In from 8 to 10 days after inoculation numbers of yellow pycnidia are formed in a group on the lower portion of the slant. These are more or less connected by a short cream white growth of surface mycelium. Except for a small amount of downy white mycelium at the upper edge of the medium and an occasional tuft at the point of inoculation, no other surface growth of any kind is developed. The pycnidia soon after their formation emit masses of orange-yellow spores. No submerged color is produced and, except for the gradual drying of the medium, there are no further changes of any kind.

Endothia havanensis sp. nov.

Stroma innate, then erumpent, gregarious, at first bright-yellow, later orange-colored, finally yellow-brown when very old, interior immediately surrounding perithecia lighter in color than outer layers, cream-white or pale-buff in newly formed stromata, commonly roundish wart-shaped to sub-elongate, $2–15 \times 2–4$ mm., varying according to the situation in which formed. Perithecia black, globose with long necks, deeply imbedded in stroma, usually $275–400\,\mu$ in diameter; ostioles dark, distinct, exserted on slender protuberances of varying lengths, these commonly $200–1000 \times 90–135\,\mu$; asci sub-clavate, eight-spored, aparaphysate, $33–41 \times 5–7.5\,\mu$; ascospores subdistichous, fusoid, two-celled, constricted at the septum, usually minutely guttulate, hyaline, often slightly inequilateral, $7.47–9.54 \times 2.92–4.15\,\mu$; pycnidia formed as irregular cavities in the stroma; pycnospores minute, rod-shaped with rounded ends, hyaline, $2.9–4.5 \times .83–1.66\,\mu$; erupting from indefinite ostioles in yellow or orange-yellow tendrils.

Habitat in dead bark of *Eucalyptus occidentalis* Endl., *E. botryoides* Sm., *E. rostrata* Schlecht., *E. microphylla* Willd., *E. robusta* Sm., *Persea gratissima* Gaertn. f., and *Mangifera indica* L., near Santiago de las Vegas, Havana, and *Spondias mombin* L., near Herradura, Pinar del Rio, Cuba.

The writer is indebted to Dr. C. L. Shear for supplying cultures and specimens of *Endothia longirostris* Earle and to Mr. R. H. Feild of Taylorsville, N. C., for specimens of *Endothia radicalis* (Schw.) DeNot.

ESTACIÓN EXPERIMENTAL AGRONÓMICA,
SANTIAGO DE LAS VEGAS, CUBA.

EXPLANATION OF PLATE CXCII

Endothia havanensis Bruner

Fig. 1. Sectional view of stroma showing perithecia.

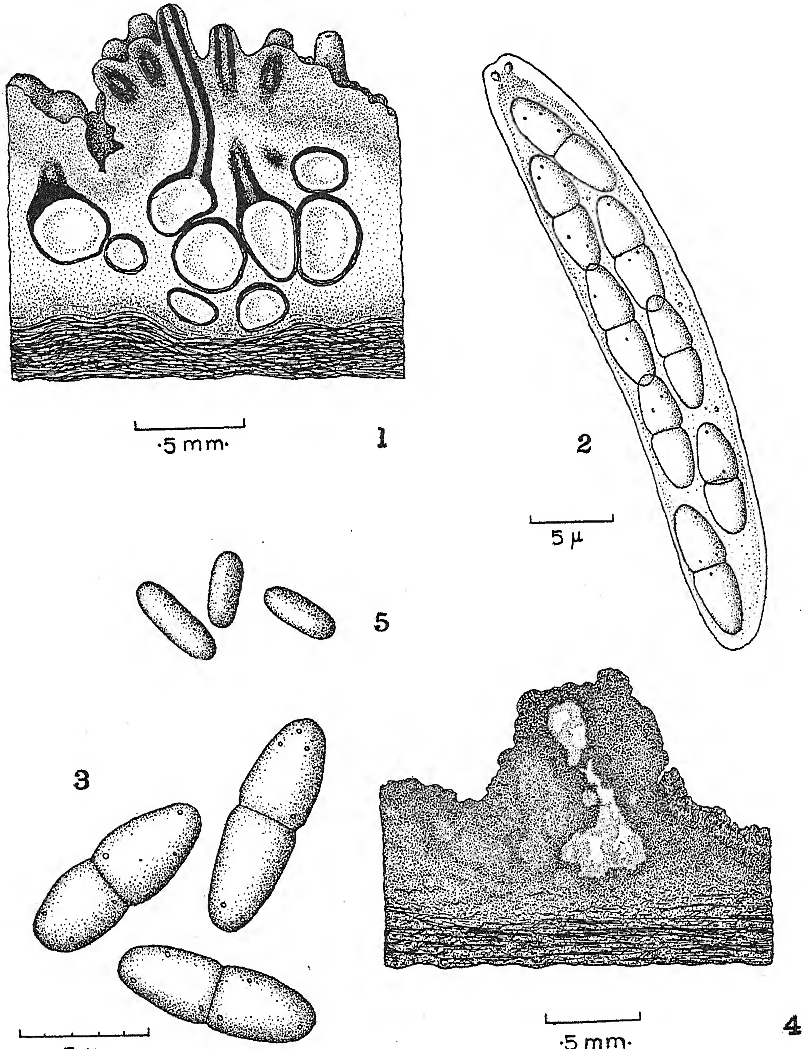
Fig. 2. An ascus.

Fig. 3. Ascospores.

Fig. 4. Section of young stroma showing pycnidial cavity.

Fig. 5. Pycnospores (see Fig. 3 for scale).

All figures drawn with the aid of a camera lucida.



ENDOTHIA HAVANENSIS BRUNER

DR. H. E. HASSE

HERMANN EDWARD HASSE,—LICHENIST

BRUCE FINK

With the passing of Doctor Hasse, October 15, 1915, botanical science lost the man who has added, it seems, the largest number of lichens to our North American flora, through his own collecting, since the days of Tuckerman. In a letter to the present writer, in 1905, Doctor Hasse said, referring to a mention of his work, "As to the very kind mention you have made of my very unworthy self in the historical part of your paper, I must say that I can scarcely deserve so much credit as you have awarded me. It has been almost entirely a matter of muscle and luck rather than brains in collecting species." However, we must still insist that the keen observation and the great pains and zeal shown in collecting so many rare things as did the late Californian lichenist involve much more than "muscle and luck." This is especially true since he entered the work after the conspicuous species had been named, and his new species were almost entirely obscure ones. But again we may call attention to the fact that Doctor Hasse's best work was accomplished, as will be seen, after the date at which he wrote the above statement.

The present writer began with Doctor Hasse, soon after his first paper on lichens appeared in 1895, a correspondence which extended through two decades. Doctor Hasse was an isolated worker and was more communicative by letter than are most botanists. Thus it comes that through this correspondence of twenty years, we have before us the main facts regarding the life of the subject of our sketch. He wrote in one letter of his birth in Freiburg, Germany, in 1836, and of his migration to America at nine years of age. Ten years later he began to work for "a druggist, a thorough chemist and botanist, to whose instruction," he says he owed "the predilection for the latter science." He began the study of medicine in St. Louis in 1856, but went to Europe the following year, where he continued the study for four years, mainly at Leipzig, with short periods of study at Prague

and Wurzburg. Returning to America in 1861, he served throughout the entire Civil War as surgeon to the 9th and the 24th Wisconsin Infantry Regiments. Throughout the war, he carried a copy of the 1857 edition of Gray's Manual, which he kept to his last days as a cherished souvenir, well filled with annotations about plants observed.

After the war, Doctor Hasse practiced medicine in Wisconsin, Missouri, Arkansas, and California, entering the last State in 1879. Ten years later, he was appointed surgeon to the Soldier's Home near Santa Monica, California, and it was in this position that botanists came to know him as a student of lichens. He resigned in 1905 and, for the last ten years of his life, gave his attention largely to the study of his favorite plants. He says in one of his letters, "I took up with lichens about 1880. But the real incentive was given about 1890, by a circular from the late Doctor Stizenberger, in which he desired contributions of Pacific Coast lichens." So it appears that Doctor Hasse worked as a collector for fifteen years before botanists became aware of him through his papers, and was at work for thirty-five years instead of merely the twenty years during which his papers were appearing frequently.

As is well known, our Californian collector and student of lichens began his work at a time when it was difficult to get much help in America. By that time he was needing help badly. Tuckerman was dead, and Willey was beyond his active years. Writing in 1896 he said, "Professor Farlow has, with great kindness, helped me out, but I am fearful of encroaching too much upon his time." Aside from this help, Doctor Hasse had no choice but to continue to send his material to Doctors Stizenberger, Nylander, and Zahlbruckner in turn. Hence the early new species were named entirely by these three European lichenists, though Doctor Hasse has in recent years named a considerable number of his new species for himself, working against the handicap of lack of literature and large collections of specimens. The three European lichenists frequently sent the names of new species with very brief diagnostic notes or none at all. In some instances descriptions were written later by themselves, or perhaps more often by Doctor Hasse as we infer from his state-

ments in letters to the present writer. How many of these still remain undescribed, could only be determined by a comparison of Doctor Hasse's correspondence with the three lichenists named with the lists of new species published as a result of his many years of collecting.

Doctor Hasse's work grew constantly in interest and importance from 1895, when his first contribution appeared until the time when his largest contribution appeared in 1913. The genus *Hassea* and several species were dedicated to him. The total number of new species resulting from his collecting in southern California in twenty-five years is not far from 75. "The lichen flora of Southern California," published in 1913 by the Smithsonian Institution, a manual of 145 pages, containing descriptions of about 400 species of lichens, with good keys, is a fitting monument to his industry and his knowledge of the lichen flora of the region covered. As will be noted in the list of titles to follow, a number of additions to the flora of the region were made after the appearance of this work.

In 1906, Mr. John I. Kane presented to the New York Botanical Garden about 3,000 species and many duplicates from Doctor Hasse's herbarium. After the death of Doctor Hasse, a large collection of lichens was purchased for the Cryptogamic Herbarium of Harvard University from Mrs. Hasse. The collection now at Harvard must be the one used by Doctor Hasse in his final work on the lichen flora of Southern California.

LIST OF PAPERS BY DOCTOR HASSE

Lichens of the vicinity of Los Angeles. I. Erythea 3: 41–44. 1895.

A list of 90 lichens with habitats. *Rinodina angelica* and *Verrucaria plumbaria* were named by Doctor Stizenberger.

Lichens of the vicinity of Los Angeles. II. Erythea 4: 96–98. 1896.

A list of 29 lichens with habitats, determined by Doctor Stizenberger.

Lichens of the vicinity of Los Angeles. III. Erythea 4: 106–108. 1896.

A list of 56 lichens with habitats. *Lecanora redimita* and *Biatora phaeophora* were named by Doctor Stizenberger.

Lichens of the vicinity of Los Angeles. IV. Erythea 4: 150, 151. 1896.

A list of 17 lichens, mostly determined by Doctor Farlow.

New species of lichens from Southern California as determined by Dr. W. Nylander and the late Dr. Stizenberger. Bull. Torr. Bot. Club 24: 445–449. 1897.

Descriptions of 19 new lichens as follows: *Parmelia subolivacea* Nyl.,

Heppia terrena Nyl., *Lecanora pleistospora* Nyl., *L. pleiospora* Nyl., *L. rediunta* Stiz., *L. obpalens* Nyl., *L.* (*Placodium*) *subpyraceella* Nyl., *L. stenospora* Stiz., *Rinodina angelica* Stiz., *Lecidea dolodes* Nyl., *L. subplebia*, *L. catalinaria* Stiz., *L.* (*Biatora*) *phaeospora* Stiz., *L. squalida persimilans* Nyl., *Arthonia subdisjuncta* Nyl., *Verrucaria plumbaria* Stiz., *V. submuralis* Nyl., *V. squamella* Nyl., and *V. inductula* Nyl.

Lichens of Southern California. Pamphlet, 1–18. Los Angeles, R. R. Baumgartner and Company, 1898.

A list of 307 lichens with notes, being a second edition of the portion on lichens in McCletchie's Seedless Plants of Southern California, 1897. New lichens named by Doctor Nylander are *Homodium microdium*, *Collemopsis segregata*, *Pannularia ruderatula*, *Heppia leptopholis*, *Lecanora* (*Placodium*) *peludella*, *L. subdispersa*, *L. praecrenata*, *L. glaucopisma*, *Arthonia pruinosella*, *Lecidea admiscens*, *L. atrolutescens*, *L. fuscatoatra*, and *Verrucaria bacillosa*.

New species of lichens from Southern California determined by Professor W. Nylander. Bull. Torr. Bot. Club 25: 632, 633. 1898.

The species described are four: *Lecanora praecrenata*, *Arthonia pruinosella*, *Thelopsis subporinella*, and *Lecidea triphragmioides*.

The genus *Dirina* in North America. Bull. So. Cal. Acad. Sci. 13: 26, 27. 1902.

Notes on *Dirina rediunta* (Stiz.) Zahlbr. and *D. Hassei* Zahlbr.

The lichen flora of San Clemente Island. Bull. So. Cal. Acad. Sci. 2: 54, 55. 1903.

A list of 22 lichens with habitats.

Contributions to the lichen flora of the California Coast Islands. Bull. So. Cal. Acad. Sci. 2: 23–26. 32–35. 1903.

The two lists contain somewhat more than 100 lichens with localities.

Additions to the lichen flora of Southern California. Bull. So. Cal. Acad. Sci. 2: 52–54. 58–60. 71–73. 1903.

Lists of about 120 lichens with notes. Nineteen lichens are spoken of as new. Of these 15 had been previously described, while *Buellia triphragmioides* appears as a nomen nudum. New and described by Nylander are *Lecidea dolodes*, *Verrucaria discordans*, and *V. dacryodes*.

Contributions to the lichen flora of Southern California. Bull. So. Cal. Acad. Sci. 5: 38–45. 1906.

A list of 98 lichens with notes.

A few lichens picked up on San Jacinto Mountain. Bull. So. Cal. Acad. Sci. 4: 123–125. 1906.

A short list with notes.

Unreported plants from the vicinity of Los Angeles, California. Muhlenbergia 3: 114. 1907.

Consists of notes on two rare seed plants.

Lichens collected in the Tehachepi Mountains, California. Bryologist 11: 55–57. 1908.

A list of 56 lichens with notes.

Additions to the lichen flora of Southern California. Bryologist 11: 6, 7. 1908.

A list of 16 lichens with notes *Lecanactis salicina* Zahlbr. appears as a nomen nudum.

Lichens collected in the Tehachepi Mountains (a correction). Bryologist **11**: 74. 1908.

A note correcting two citations of authors in the previous paper.

Additions to the lichen flora of Southern California. Bryologist **13**: 60–62. 1910.

Descriptions of five lichens, of which *Bacidia clementis* Hasse and *Haematomma pacifica* Hasse are new species.

Additions to the lichen flora of Southern California. No. 4. Bryologist **13**. 111–112. 1910.

The paper consists of descriptions of three lichens, of which *Lecanora marginalis* Hasse is new.

Additions to the lichen flora of Southern California. No. 5. Bryologist **14**: 2–4. 1911.

Descriptions of five lichens, of which *Biatorella terrena* Hasse, *Acarospora peltata* Hasse, and *Caloplaca verrucosa* Hasse are new.

Additions to the lichen flora of Southern California. No. 6. Bryologist **14**: 100–102. 1911.

The paper consists of descriptions of the following new species, named by Hasse: *Heppia Zahlbruckneri, Bacidia Kingmani, Dirina catalinariae,* and *Caloplaca Rosei.*

Additions to the lichen flora of Southern California. No. 7. Bryologist **15**: 45–48. 1912.

Descriptions of nine rare lichens, of which *Lecidea bullata* Hasse and *Mycoporellum Hassei* Zahlbr. are new.

Additions to the lichen flora of Southern California. No. 8. Bryologist **16**: 1, 2. 1913.

The paper consists of descriptions of four lichens, of which *Maronea constans sublecideina* Zahlbr. and *Dermatocarpon Zahlbruckneri* Hasse are new.

The lichen flora of Southern California. Cont. U. S. Nat. Herb. **17**: I–XIII. 1–132. 1913.

This publication contains good keys, and descriptions of about 400 lichens, of which about 65 were discovered in the region covered. New species are *Microglaena subcorallina* Hasse, *Endocarpon lepidallum* Nyl., *Thelopsis subporinella* Nyl., *Mycoporellum epistigmellum* Hasse, *M. Hassei* Zahlbr., *Lecidea fuscatoatra* Nyl., *L. subplebeia* Nyl., and *Acarospora aeruginosa* Hasse.

Report of the lichen department for 1913. Bryologist **17**: 15. 1914.

A new *Reinkella* from Mexico, *Reinkella Parishii* Hasse. Bryologist **17**: 45, 46. 1914.

Additions to the lichen flora of Southern California. No. 9. Bryologist **17**: 61–63. 1914.

Lecania fructigena Zahlbr., *Acarospora californica* Zahlbr., *Placolecania Hassei* Zahlbr., and *Lecanora peltastictoides* Hasse are new.

A new species of *Blastenia*. Bryologist **17**: 92. 1914.

Doctor Hasse describes *Blastenia Herrei* from Washington.

Report of the lichen department for 1914. Bryologist **18**: 15, 16. 1915.

Additions to the lichen flora of Southern California. No. 10. Bryologist **18**: 22, 23. 1915.

Two of Doctor Zahlbruckner's new species are described, *Rinodina dirinoides* and *R. euryspora.*

A note on *Blastenia Herrei* Hasse. Bryologist 18: 29. 1915.

The note states that this species is a synonym for *Lecanora atrosanguinea* Merrill, previously described.

Additions to the lichen flora of Southern California. No. 11. Bryologist 18: 76–79. 1915.

A list of species with notes.

MIAMI UNIVERSITY,
OXFORD, OHIO.

SOME KENTUCKY FUNGI

L. O. and Mae F. Overholts

In the summer of 1915, the writers spent three days, July 10–12, collecting fungi in Madison County, Kentucky. The first place visited was Richmond, where only a few collections were made in the limited time available. The journey was then continued to Berea, at the base of the Cumberland Mountains, where the remainder of the time was spent. The region west and south of Berea is extremely rough, and the hills and valleys yielded a great profusion of fleshy fungi after the copious rains of several previous weeks.

Very little attention has been given to the fungous flora of Kentucky. In 1909, Dr. Bruce Fink spent portions of the months of August and September in this same region. He made about seventy-five collections of *Boletaceae,* representing about thirty species. These were identified by Dr. Murrill and the list published by him in *Mycologia* for November of that year. A few collections belonging to families other than the *Boletaceae* were subsequently turned over to the senior writer and are included in the present list. Aside from the above mentioned brief account, no local check list has ever been published from any locality within the state.

The fungous flora of Kentucky is of particular interest in that it combines the flora of the north central prairie states with that of the Appalachian Mountains. In addition, we may expect to find within the state a considerable number of typically southern species. It was thought that the present list might be of interest to workers within the state, or might stimulate collectors in other parts of the state to publish their results, for it is only through the united efforts of a large number of local collectors that we can become acquainted with the fungous flora of any large region.

The present list is recognized to be extremely incomplete and perhaps it does not represent as much as one-tenth of the number of species that may be expected to occur within the state. Most

of the collections were made either on the wooded campus of Berea College or else in Cow Bell Hollow, a wooded tract also owned by the college and distant about four miles from the town. Big Hill, another station, is in the same locality. Specimens of all but a few of the species listed here are preserved in the herbarium of the senior writer. We are under special obligation to Professor C. D. Lewis, of Berea College, for supplying facilities for drying the specimens in the biological laboratory.

ASCOMYCETES

Leotia chlorocephala Schw. On the ground by stream. Cow Bell Hollow.

BASIDIOMYCETES

1. Tremellaceae

Tremella albida Fries. On oak wood. Berea College Campus. At least this is the plant that goes by the above name in this country.

2. Thelephoraceae

Craterellus cantharellus Schw. ex Fries. On the ground under oaks. Berea College Campus.

C. cornucopioides L. ex Pers. On the ground in woods. Cow Bell Hollow.

Stereum fasciatum Schw. On oak log. Cow Bell Hollow.

Thelephora anthocephala Bull. ex Fries. On the ground in oak woods. Berea College Campus.

T. palmata Scop. ex Fries. On the ground in woods. Cow Bell Hollow.

Tremellodendron pallidum Schw. On the ground in woods. Cow Bell Hollow. (= *Thelephora Schweinitzii.*)

3. Clavariaceae

Clavaria fusiformis Sow. On the ground in woods. Big Hill, August 18, 1909, Dr. Bruce Fink. Three other collections of *Clavaria* were made, none of which have been positively identified.

4. Hydnaceae

Hydnum adustum Schw. On oak limbs. Cow Bell Hollow.

H. erinaceum Bull. Dried specimen found in Botany laboratory of Berea College. Data unknown.

H. zonatum Batsch. ex Fries. On mossy ground. Cow Bell Hollow.

5. Polyporaceae

Fomes applanatus Pers. ex Wallr. On oak log. Cow Bell Hollow.

F. lobatus Schw. ex Cooke. Around old stump. Cow Bell Hollow.

F. rimosus Berk. On living black locust. Richmond.

Polyporus Berkeleyi Fr. On the ground at base of oak tree. Berea College Campus.

P. cinnabarinus Jacq. ex Fries. On oak log. Cow Bell Hollow.
P. cinnamomeus Jacq. ex Fries. On mossy bank. Cow Bell Hollow.
P. Curtisii Berk. Around stump. Cow Bell Hollow.
P. gilvus Schw. ex Fries. On oak wood. Berea College Campus.
P. hirsutus Wulfen ex Fries. On dead wood. Berea College Campus.
P. pargamenus Fries. In wounds on living oak. Berea College Campus.
P. robiniophilus Murrill ex Lloyd. On living black locust. Richmond.
P. semipileatus Peck. On dead oak limbs. Cow Bell Hollow.
P. tulipiferus Schw. ex Overholts. On dead oak limbs. Berea College Campus.
P. versicolor L. ex Fries. On dead branches and on old stumps. Berea College Campus.
Trametes carnea Nees ex Cooke. On dead pine logs. Big Hill, August 25, 1909, Dr. Bruce Fink.

6. Boletaceae

Boletus auriporus Peck. On the ground in oak woods. Berea College Campus.
B. felleus Bull. On the ground in open woods. Cow Bell Hollow.
B. retipes Berk. & Curt. On the ground in woods. Cow Bell Hollow.
Fistulina hepatica Fries. At base of living chestnut. Cow Bell Hollow.
Strobilomyces strobilaceus Scop. ex Berk. Around a rotten log. Cow Bell Hollow.

7. Agaricaceae

Amanita caesarea Scop. ex Fries. On the ground in oak woods. Cow Bell Hollow.
A. Frostiana Peck. On a rotten log in mixed woods. Cow Bell Hollow.
A. phalloides Fries. On the ground in oak woods. Berea College Campus.
A. rubescens Fries. On the ground in oak woods. Berea College Campus.
Amanitopsis albocreata Atk. On the ground in oak woods. Berea College Campus.
A. agglutinata Berk. & Curt. On a clay bank. Cow Bell Hollow.
Cantharellus cibarius Fries. On the ground in mixed woods. Cow Bell Hollow.
C. cinnabarinus Schw. On the ground in oak woods. Berea College Campus.
C. minor Peck. On the ground in mixed woods. Cow Bell Hollow.
C. infundibuliformis Scop. ex Fries. On the ground in mixed woods. Cow Bell Hollow.
Clitocybe illudens Schw. Around an oak stump in mixed woods. Cow Bell Hollow.
C. laccata Scop. ex Fries. On the ground in mixed woods. Cow Bell Hollow.
C. infundibuliformis Schaeff. ex Fries. Among leaves in mixed woods. Cow Bell Hollow.
Collybia platyphylla Fries. On an old log in mixed woods. Cow Bell Hollow.
C. radicata Relh. ex Fries. On the ground in clearings. Cow Bell Hollow.
Hygrophorous miniatus Fries. On the ground in woods. Cow Bell Hollow.
Hypholoma incertum Peck. On the ground under oaks. Berea College Campus.
Lactarius Gerardii Peck. On the ground in woods. Cow Bell Hollow.
L. lactiflua L. ex Burl. On the ground in woods. Cow Bell Hollow.
L. subdulcis Pers. ex Fries. On the ground in oak woods. Berea College Campus.

L. trivialis Fries. On the ground in woods. Cow Bell Hollow.

Lepiota Morgani Peck. On grassy ground along street. Berea.

Marasmius siccus Schw. Among leaves on the ground under oaks. Cow Bell Hollow.

Paxillus corrugatus Atk. On a dead pine log. Cow Bell Hollow. August 18, 1908, Dr. Bruce Fink.

Pleurotus petaloides Fries. On rotten wood. Cow Bell Hollow.

Psathyrella disseminata Pers. ex Fries. On the ground by roadside. Cow Bell Hollow.

Russula crustosa Peck. On the ground under oaks. Berea College Campus.

R. foetens Pers. ex Fries. On the ground in woods. Cow Bell Hollow.

R. lactea Pers. ex Fries. On the ground under oaks. Berea College Campus.

DEPARTMENT OF BOTANY,
PENNSYLVANIA STATE COLLEGE.

BIBLIOGRAPHY AND NEW SPECIES OF PHILIPPINE FUNGI[1]

PAUL W. GRAFF[2]

In 1906, Ricker,[3] of the United States Department of Agriculture, in his article entitled, "A List of Known Philippine Fungi," appended a bibliography which, while lacking in titles by about one third, was still of interest to one interested in that locality. Since that date the number of articles on the region has greatly increased and the numbers of types of both genera and species is so large that this paper is published with the hope that it may be an aid to those interested in the fungi of the Pacific islands, especially the Philippines and their neighbors. It has been the endeavor to include in this enumeration all publications on Philippine fungi, so far as the writer has been able to locate them, appearing prior to January, 1916. In the short note under each title will be found a list of such species as are described as new; the name given being that used by the author of each paper. This is deemed more useful than to endeavor to make them conform to any one system of classification. Practically all of these references may now be found in the library of the Bureau of Science at Manila.

1820

EHRENBERG, C. G. Fungos a viro clarissimo Adelberto de Chamisso de Boncourt, sub auspiciis Romanzoffianis in itinere circa terrarum globum collectos, in Nees ab Essenbeck's Horae Physicae Berolinenses, pp. 79–104, *pl. 17–20, fig. 1–17.*

On the visit of the Romanzoff Expedition to the Philippines with Chamisso as botanist a number of plants were collected but among them only one fungus is reported. This is described as

[1] Published with the permission of the Director of the Bureau of Science, Manila, P. I.

[2] Contribution from the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.

[3] Philip. Journ. Sci. 1: Suppl. 277–294.

a new species, *Sphaeria eschscholzii,* and figured in plate 18, fig. 8. The species is a Daldinia and closely related to *D. concentrica.* It has since been collected in these islands and reported by Rehm as *Daldinia eschscholzii.* This is the first report of any fungous collection having been made in the Philippines.

1830

NEES VON ESSENBECK, C. J. Fungi, in Presl's Reliquias Haenkeanae, p. 1–2.

In March, 1792, Thaddeus Haenke reached Manila in his travels, begun in 1789, and remained in the Islands about six months. He visited the provinces of Bulacan, Ilocos, Pampanga, Sorsogon, Cavite and Mindanao, making some considerable collection of the island flora. The fungi of his entire travels, however, number but three species which were identified by Nees von Essenbeck. But one of these, *Polyporus sanguineus* Fr., is reported as having been collected in Luzon.

1837

BLANCO, P. Fr. Manuel, Flora de Filipinas, pp. 845–846.

This work makes almost no mention of fungi. After mentioning the fact that there are numerous species of Agarics to be found in the Islands, the name of one fungus is given. This is cited as *Sclerotium subteraneum,* but is in reality a species of Xylaria; probably *Xylaria nigripes* (Klotz.) Sacc., an interesting species cultivated by the termites in their underground nests and used by them as food.

1842

BERKELEY, M. J. Enumeration of Fungi Collected by H. Cuming Esq., F. L. S. in the Philippine Islands. Lond. Journ. Bot. 1: 142–157, *pl. 6, 7.*

The second reported collection of fungi of any importance to be made in these islands was that of Cuming made during the years 1836 and 1840, and, on being sent to England, were determined by Berkeley who published their descriptions in 1842. Meyen made a collection in 1831 but his "Observationes" were not published until 1843. This present list of Cuming's material gives a total of thirty-five species, all Basidiomycetes with the

exception of five belonging to the Ascomycetes. Of this list twenty-three are described as new species. These are cited as follows:

Agaricus (Psalliota) *philippinensis, Lentinus connatus, Panus badius, Lenzites pallida, L. acuta, Polyporus* (Mesopus) *cumingii, P.* (Pleuropus) *grammocephalus, P.* (Pleuropus) *philippinensis,* P. (Apus) *elongatus, P.* (Apus) *intybaceus, Trametes versatilis, T. badia, Daedalea inconcuma, D. tenuis, Stereum perlatum, Corticium hydnatinum, Clavaria serculus, Sphaeria* (Cordyceps) *pileiformis, S.* (Caespitosae) *examinans, S.* (Pertusae) *micraspira, Tulostoma pusillum,* and *Dichonema erectum.*

MONTAGNE, CAMILLE. Plantes Cellulaires Exotiques Novelles, Dec. V–VIII. Ann. Sci. Nat. Bot. II. **18**: 241–282.

One species is described as new; *Polyporus* (Apus perennis) *ochreo-laccatus,* collected by Cuming and which was omitted by Berkeley from his descriptions of Cuming's collection.

1843

KLOTZSCH, J. F. Fungi, in F. J. F. Meyen's Observationes Botanicae. Nov. Act. Acad. Caes. Nat. Cur. 19, Suppl. **1**: 233–246.

Meyen's collections were made while on a journey around the world between 1830 and 1832. The expedition visited Manila from September 16 to October 15, 1831, between two stops in China. The small collection of nine specimens was the first of any consequence made in the Islands; the only other collections from here being Chamisso's, Blanco's and Haenke's single specimens previously noted. While Berkeley published his enumeration of Cuming's material prior to this the actual collecting was done about six years later. Of the nine species from the Philippines six are described as new: *Hexagona ciliata, Polyporus meyenii, Stereum spectabile, Dictyophora speciosa,* and *Actinostroma* as a new genus with *A. infundibuliforme* and *A. crassum.* In his same volume Meyen mentions eighteen Philippine lichens collected in the vicinity of Manila, four of which he describes as new species.

1844

BERKELEY, M. J. Decades of Fungi. Lond. Journ. Bot. 3: 185–194, *pl.* 5, 6.

In this article Berkeley gives six additional numbers from Cuming's collection of Philippine plants omitted from his previously mentioned article. Of these five are Basidiomycetes and one an Ascomycete. Three of the Basidiomycetes are described as new species. These include *Polyporus* (Pleuropus) *brunneolus, P.* (Apus) *tostus,* and *Hydnum webii.*

LÉVEILLÉ, J. H. Champignons Exotiques. Ann. Sci. Nat. Bot. III. 2: 167–221.

Of the 210 species of Basidiomycetes mentioned from the tropical Pacific in this article twelve are from the Philippines and all but three of these are described as new species. The new species are described under the following names:

Agaricus (Pleuropus) *noctilucens, Lenzites platypoda, Polyporus microloma, Trametes dermatodes, T. incana, Favolus fibrillosus, Thelephora* (Mesopus) *paradoxa, Stereum adustum* and *Cladoderris blumei.*

Most of this material was collected on the voyage of the Bonite between 1836 and 1837, by Gaudichaud-Beaupré, and is in the herbarium of the Paris Museum.

BLANCO, P. Fr. Manuel. Flora de Filipinas, Ed. II, pp. 583–584.

There are no additions to the fungus flora of the Islands in this edition. The description of *Sclerotium subterraneum* and the general statement regarding Agarics remains unrevised.

1845

LÉVEILLÉ, J. H. Champignons Exotiques. Ann. Sci. Nat. Bot. III. 3: 61–67.

But one species is mentioned from the Philippines in this paper. This was collected by Cuming in the vicinity of Manila and is described as *Chaetomium cumingii,* a new species related to *C. amphitricha* Corda.

1846

LÉVEILLÉ, J. H. "Champignon," in Gaudichaud-Beaupré's Voyage de la Bonite 1: 164–204.

The voyage of the Bonite took place in the years 1836–1837, with Gaudichaud-Beaupré as botanist of the expedition. A considerable amount of botanical material was collected by him

throughout the tropics. The fungi of this expedition were determined by Léveillé, who published diagnoses of several new species in a previously cited article.[4] This publication contains a list of ten fungi which were collected during the stay at Manila. All of these are previously described species. In the same volume of the "Voyage" are published the "Algae" and "Lichens" by Montagne, in which he mentions three lichens from the vicinity of Manila.

1851

CALZADO, P. Fr. Antonio L. A. Fragmentos de Algunas Plantas de Filipinas, pp. 115–116.

This little publication contains notes on a number of plants not included by Blanco in his "Flora de Filipinas." Nine species of Basidiomycetes are listed and followed by the statement that, "Hay otras muchas especies y variedades de hongos que seria largo enumerar." One of the nine species, *Merulius conicus,* is described as a new species. This, from the meagre Spanish description accompanying it, one would be inclined to place as a *Coprinus.*

1862

CURTIS, M. A. and BERKELEY, M. J. "Fungi," in the Wilkes United States Exploring Expedition **17**: 195–202.

As far as fungi are concerned, this paper makes almost no mention of the Philippines. But one species, *Polyporus brunneolus* Berk., is given as having been collected in the Islands.

1878

BERKELEY, M. J. Enumeration of the Fungi collected during the Expedition of H. M. S. "Challenger," 1874–1875. (Third Notice.) Journ. Linn. Soc. Bot. **16**: 38–54.

These fungi were collected in the southern part of the Archipelago, from Camiguin, Malanipa, and Malamon, between January 30th and February 4, 1875. There are here listed thirty Philippine species of which twenty-nine are Basidiomycetes and one an Ascomycete. Two numbers from "Little Ke" are in-

[4] Ann. Sci. Nat. Bot. III, 3 (1844) 167–221.

cluded in this list by mistake. Ten new species and one new variety are described including:

Lentinus abnormis, Polyporus (Anodermi) *laeticolor, P.* (Anodermei) *ostreaeformis, P.* (Placodermei) *zonalis* Fr. var. *semilaccatus, P.* (Placodermei) *caliginosus, P.* (Placodermei) *endothejus, Trametes conchatus, Hexagona albida, H. flabelliformis, H. cladophora, Stereum moselli.*

1879

BLANCO, P. Fr. Manuel. Flora de Filipinas, Ed. III. 3: 265–266.

In this enlarged edition of his work, Blanco makes no revision in that portion in which he deals with the fungi. While he claims there are many in the Islands, he confines all his studies to the flowering plants.

1889

PATOUILLARD, N. La Generė Ganoderma. Bull. Soc. Myc. Fr. 5: 64–80, *pl. 10, 11.*

Forty-eight species of Ganoderma are enumerated in this article, of which seven are described as new. Two species, neither of which are new, are cited as from the Philippines; *Ganoderma ochrolaccatum* and *G. amboinense.*

1892

MAGNUS, P. Ueber eine neue Epichloë aus dem ostindischen Archipelago. Atti Congr. Bot. Intern., pl. 8.

This article devotes several pages to the discussion and descrip- of a new species of Epichloë (*E. warburgiana*). This fungus was collected by Warburg at Cabongenam, Luzon, during the year 1888, as a parasite in the inflorescence of *Clinogyne* sp., and sent to Magnus for determination.

1893

DE BERARD, Rapport sur un maladie des Cafeiers aux iles Philippines. Bull. Minist. Agr. (Paris) 8: 1008–1024.

This report discusses the very common disease of the coffee plant caused by the fungus *Hemileia vastatrix* Berk. & Br., and considers its spread and the damage caused by this blight in the Philippines.

HENNINGS, P. Fungi Warburgiana. Hedwigia 32: 216–227.

In 1888 Dr. O. Warburg visited the Philippines during a journey which included among its stopping places localities in India, China, Korea, Japan, the Philippines, islands of the Malay and Bismark Archipelagos and Australia. This journey was taken between the years 1885 and 1889 and during it considerable collections were made in all groups of plants. Each group being assigned to a specialist, Hennings undertook the determination of the fungi and with a small amount of additional material from other sources, published a list of thirty-one species from the Philippines. This list contains five fewer names than appear later in his list in Warburg's "Monsunia" but contains three, *Lachnocladium* sp?, *Polystictus sanguineus* (L.) Mey., and *P. flabelliformis* Klotz., which are not published there. There appears but one new species, *Xylaria* (*Thamnomyces*) *luzonensis*.

1899

MASSEE, GEORGE. Fungi Exotici, II. Kew Bull. Miscel. Inf. pp. 164–185.

In this article which enumerates a considerable number of fungi from the tropics, chiefly Asiatic, there are listed nine species collected by Loher in Luzon, mostly from the vicinity of Manila. Among these is but one, *Favolus purpureus*, which is described as new.

1900

DELACROIX, E. G. Les maladies et les ennemis des Caféiers, p. 42.

In this treatise on coffee diseases the author reports *Hemileia vastatrix* on both *Coffea arabica* and *C. liberica* in the Philippines.

HENNINGS, P. Fungi, in Warburg's Monsunia 1: 1–38.

Thirty-six fungi are listed from the Philippines, the greater number of which were collected by Warburg in 1888. Of the lot but six are described as new species: *Aecidium luzoniense*, *Nectria* (Plaeonectria) *manilensis*, *Ustilaginoidea ochracea*, *Aschersonia cinnabarina*, *A. confluens*, and *Fusarium paspalicola*. These six new species as well as *Pilocratera hindsii* (Berk.) P. Henn., and *P. tricholoma* (Mont.) P. Henn., did not

appear in the previous list of Warburg's material published by Hennings in Hedwigia.

1903

SYDOW, H. and P. Neue und kritische Uredineen. Ann. Myc. 1: 324–334.

Among a number of new species of Uredineae described is one, *Uromyces deeringiae,* from the Philippines. It is probable that this is a hitherto unpublished species from Warburg's collection.

1904

THAXTER, ROLAND. Notes on the Myxobacteriaceae. Bot. Gaz. 37: 405–416.

Among several pages of remarks on this interesting group of plants, in which some eight new species from various localities are described, one collection from the Philippines is recorded. This species, *Chondromyces aurantiacus* (B. & C.) Thaxt., was collected in the Islands by Mr. Reade and communicated by him to the author.

1905

COPELAND, E. B. Fungi Esculentes Philippinenses. Ann. Myc. 3: 25–29.

Diagnoses of twenty-one species of Basidiomycetes are published under the following names:

Lycoperdon todayense, Coprinus confertus, C. ater, C. ornatus, C. bryanti, C. concolor, C. volutus, C. revolutus, C. rimosus, C. pseudo-plicatus, Panaeolus pseudopapilionaceus, P. panaiensis, Agaricus (Psalliota) *boltoni, A.* (Ps.) *merrillii, A.* (Ps.) *argyrostectus, A.* (Ps.) *manilensis, A.* (Ps.) *perfuscus, Lepiota chlorospora, L. candida, L. manilensis,* and *L. elata.*

COPELAND, E. B. New Species of Edible Philippine Fungi. Gov't Lab. Publ. 28: 141–146, 3 pl.

An English translation of the preceding paper in which the diagnoses appeared in latin.

USTERI, A. Beitrage zur Kenntnis der Philippinen und ihrer Vegetation, etc. Inag. Diss. Ph. D. Zurich, p. 136.

Contains a list of sixteen fungi from the island of Negros. All belong to the Hymenomycetes and were sent to Hennings for determination. There are no new species enumerated and the list only includes common tropical forms.

1906

MASSEE, GEORGE. Revision of the Genus Hemileia, Berk. Kew Bull. Miscel. Inf. pp. 35–42.

In the portion of this article covering *Hemileia vastatrix,* the fungus is reported from the Philippines on *Coffea arabica* and *C. liberica.*

SYDOW, H. and P. Neue und kritische Uredineen, IV. Ann. Myc. 4: 28–32.

In this short paper, in which are described new species of Uredineae from various parts of the world, five are described as new from the Philippines. These include the following:

Uromyces hewittiae on *Hewittia bicolor, Uredo davaoënsis* on *Cyanotidis* sp., *U. hygrophilae* on *Hygrophila salicifolia, U. philippinensis* on *Cyperus polystachyus* and *U. wedeliae-biflorae* on *Wedelia biflora.*

RICKER, P. L. A List of Known Philippine Fungi. Philip. Journ. Sci. 1: Suppl. 227–294.

In this article the author attempts to bring together in a single list all species so far credited to the Archipelago, adding a few names from the determination of a collection of sixty numbers sent him from the Islands. There are but five new species described in the list of 156 fungi: *Phyllachora merrillii, Nummularia philippinensis, Trematosphaeria palaquii, Stereum luzoniense* and *Thelephora diamesa.* At the end is appended a bibliography of sixteen references.

SYDOW, H. and P. Novae Fungorum Species, III. Ann. Myc. 4: 343–345.

Auerswaldia copelandi collected on leaves on *Caryota* sp., in the vicinity of Zamboanga, Mindanao, is described as new. It is the only species cited in this article from the Philippines.

1907

MASSEE, GEORGE. Philippine Myxogastres. Philip. Journ. Sci. Bot. 2: 113–115.

Of the eighteen species listed none prove to be new but are, for the most part, very cosmopolitan. Nine genera are represented in this small collection and are from various provinces of the Archipelago. This is the first reported collection of species from this group of the fungi known from the Philippines.

MURRILL, W. A. Some Philippine Polyporaceae. Bull. Torr. Bot. Club 34: 465–481.

This article gives a considerable addition to the known species of Polypores from these islands. There are included collections made by Mr. R. S. Williams, mainly on the slopes of Mount Mariveles in Bataan Province, and by Mr. E. D. Merrill and Mr. A. D. E. Elmer in Luzon, Mindoro, Leyte, Culion, Palawan and Mindanao. Of the sixty-seven species listed, twenty-four are described as new species and nineteen are made new combinations. The nomenclature of a number of these species has been revised by Bresadola in later papers to bring them in accord with the "Vienna Code." The following is the list of species published as new:

Coriolus cuneatiformis, Funalia philippinensis, Hapalopilus subrubidus, Inonotus elmerianus, Microporellus subdealbatus, Polyporus coracinus, P. palensis, Spongipellis, luzonensis, Trametes caespitosa, T. lamaensis, T. luzonensis, T. subacuta, T. williamsii, Tyromyces elmeri, Amauroderma elmerianum, Elfvingia elmeri, Fomes luzonensis, F. philippinensis, Ganoderma subtornatum, G. williamsianum, Pyropolyporus lamaensis, P. merrillii, P. williamsii, and *Gloeophyllum edule.*

REHM, H. Ascomycetes Novi. Ann. Myc. 5: 516–546.

In this article, which includes descriptions of new species of fungi from various parts of the world, a single species, *Mollisia* (Pseudotapesia) *copelandi,* is described from the Philippines. The fungus was collected on leaves of *Caryota* sp. at Zamboanga, Mindanao and communicated to Rehm for identification.

1908

MURRILL, W. A. A Collection of Philippine Polypores. Leafl. Philip. Bot. 1: 262–271.

In this paper thirty-six species are enumerated. They were collected in three localities, Mount Mariveles in Bataan Province, Mount Banajao in Laguna Province and in Tayabas Province, in Luzon and at Palo in Leyte, by Mr. A. D. E. Elmer. No new species are described but a number of these were described as new in an article by the same author appearing in the Bull. Torr. Bot. Club of the previous year.

COPELAND, E. B. Bud Rot of the Cocoanut. Philip. Agrl. Rev. 1: 210–220.

This paper is a report of personal investigation of an attack of the Bud Rot disease in the cocoanut region of Laguna and Tayabas Provinces. Whether it is the West Indian bacterial disease or the Pythium disease, reported by Butler as being the cause of the trouble in India, was not ascertained.

ROBINSON, C. B. Sugar-cane Smut. Philip. Agrl. Rev. 1: 295–297.

The investigation of an attack of *Ustilago sacchari*, on sugar-cane in the Province of Laguna in Luzon, is reported in this article and suggestions given for the prevention of the trouble in the Islands.

HENNINGS, P. Fungi Philippinenses. Hedwigia 47: 250–265.

Of the 112 species published in this paper, sixty-two or more than half are described as new species. The greater number of these were collected by E. D. Merrill with a less number by Foxworthy, Whitford and Mrs. Clemens. As to locality, the islands of Luzon, Mindoro, Panay, Samar and Mindanao are represented. The specimens are distributed among the following groups: Five belonging to the Ustilagineae, twenty-one to the Uredineae, sixty-two to the Ascomyceteae and twenty-four to the Deuteromyceteae. One new genus is described, *Merrillopeltis* with *M. calami* as the type. The new species described include:

Cintractia merrillii, C. cyperi-polystachyi, Puccinia merrillii, Coleosporium merrillii, Uredo anthraxonis-ciliaris, U. castaneae, U. knoxiae, U. abri, Aecidium plucheae, A. blumeae, A. uvariae-rufae, Dimerosporium mindanaense, Calonectria copelandii, Hypocrella schizostachyi, Phyllachora fici-minahassae, P. canarii, P. ardisiae, P. macarangae, P. pongamiae, P. luzonensis, P. parkiae, Auerswaldia merrillii, A. derridis, Scirrhia luzonensis, Roumegueria ichnanthi, Rosellinia cocoës, R. bambusae, Apiospora luzonensis, Physalospora ramosii, Ophiobolus nipae, O. livistonae, Gibberidea nipae, Julella luzonensis, Endoxyla mangiferae, Diatrype mindanaensis, Hypoxylon hibisci, H. nucigenum, H. apoënse, Xylaria copelandii, X. bataanensis, Asterina derridis, Lembosia dipterocarpi, Parmularia hymenolepidis, Hysterium hoyae, Tryblidiella mindanaensis, Merrillopeltis calami, Rhytisma viburni, R. lagerstromiae, Leptopeziza mindanaensis, Phyllosticta acoridii, Placosphaeria merrillii, P. tiglii, Sphaeropsis pandani, Coniothyrium coffeae, C. gmelinae, C. oroxyli, Diplodia gmelinae, D. hibisci, D. fructus-pandani, Brachysporium pini-insularis, Cercospora tiglii, Sporocybe philippinensis.

HENNINGS, P. Fungi Philippinenses. Philip. Journ. Sci. Bot. 3: 41–58.

This article is a repetition of the one published by him in Hedwigia a month prior and aside from listing 112 species instead of 110 and describing one other new species, *Cercospora helminthostachydis,* the papers are identical.

MURRILL, W. A. Additional Philippine Fungi. Bull. Torr. Bot. Club 35: 391–416.

This paper includes determinations of a considerable number of species sent to the New York Botanical Garden for that purpose in the early part of the year. The material was collected in various parts of the Archipelago by E. D. Merrill, A. D. E. Elmer, H. N. Whitford, Mrs. Mary S. Clemens, and others. Ninety-eight species are listed, forming a very material addition to the fungus flora of the Islands, from various parts of the island of Luzon, from Mindoro, Negros, Panay, Balabac, Mindanao and the Babuyanes. Of these thirty-eight species are described as new. One new genus, *Whitfordia,* is described, with *W. warburgiana* (P. Henn.) as the type. The following includes the names of the new species as published:

Coltricia benguetensis, Coriolopsis copelandi, C. bataanensis, C. melleoflavus, C. subcrocata, Coriolus clemensiae, C. currani, C. perpusillus, C. rubritinctus, C. subvernicipes, Cycloporellus barbatus, Favolus resinosus, F. subrigidus, Hapalopilus ramosii, Hexagona luzonensis, H. pertenuis, Inonotus clemensiae, Trametes conglobata, T. insularis, Tyromyces merrittii, T. subchioneus, T. unguliformis, Whitfordia warburgiana, Amauroderma asperulatum, A. bataanense, A. clemensiae, A. ramosii, Fomes subresinosus, F. subungulatus, Ganoderma balabacense, G. currani, Pyropolyporus subextensus, P. tenuissimus, P. tricolor, Daedalea isabellina, D. subconfragosa, Gloeophyllum nigrozonatum, Lenzites clemensiae, and *L. submurina.*

1910

SYDOW, H. and P. Fungi novi Philippinenses. Ann Myc. 8: 36–41.

This short article is composed entirely of descriptions of new species. Twenty-two species are included the greater part of which were collected by E. D. Merrill. All belong to the Micromycetes and comprise the following:

Puccinia mesomorpha, Uredo manilensis, Meliola hyptidis, Valsella pinangae, Rosellinia procera, Nummularia gracilenta, Hypoxylon minutellum, H.

lilliputianum, Xylaria gracilenta, Phyllachora aggregatula, P. circinata, P. lepida, Homostegia fusispora, Hypocrella botryosa, Seynesia scutellum, Lembosia congregata, Mollisia ravida, Bulgaria pusilla, Cytospora calami, C. lirella, Melasmia exigua and *Septogloeum aureum.*

SYDOW, H. and P. Fungi Philippinenses. Philip. Journ. Sci. Bot. 5: 163–166.

Forty-nine species of fungi belonging to various groups are listed in this article. No new species are described. Of this number sixteen have already been mentioned as from the Philippines in the preceding paper by the same author where they were described as new species.

1911

LISTER, ARTHUR. A Monograph of the Mycetozoa. Ed. II, pp. 1–302, *pl. 1–200.*

Sixteen of the species and one variety are mentioned as being found in the Philippines. The specimens cited are to be found in the herbarium of the British Museum and belong to the material previously listed by Massee in 1907 in the Philip. Journ. Sci. Bot. 2: 113–115. The nomenclature has been changed and but three are to be found under the names previously cited.

ROBINSON, C. B. Corn Leaf-Blight in the Philippines. Philip. Agrl. Rev. 4: 356–358.

The leaf-blight of corn caused by *Helminthosporium turcicum* Pass., is reported from the Mountain Province on "Mexican June" but as *H. inconspicuum* C. & E. The disease was not imported with the seed as this was the third generation grown in the Islands and neither of the two preceding showed any signs of the malady. The same fungus has been reported as doing considerable harm to the corn crop in Japan.

SYDOW, H. and P. Notes and Descriptions of Philippine Fungi, I. Leafl. Philip. Bot. 4: 1153–1159.

In this article notes and descriptions of twenty-two species collected in various parts of the Archipelago by A. D. E. Elmer are given. Of these the following eleven are described as new:

Pseudomeliola placida, Stigmatea bullata, Asterina escharoides, A. diaphana, A. elaeocarpi, A. elmeri, Phyllachora glochidii, P. elmeri, P. apoënsis, Darwinella orbicula, and *Placosphaeria durionis.*

SYDOW, H. and P. Novae Fungorum Species, VI. Ann. Myc. 9: 142–146.

Of this collection of fifteen fungi, mostly tropical, four new species are described from the Philippines. These include *Melampsora cingens* on *Bridelia* sp., *Ustilago flagellata* on *Rottboellia exaltata*, *Peroneutypella cocoës* on *Cocos nucifera*, and *Rosellinia dolichospora* on *Phragmites karkae*.

BRESADOLA, J. Basidiomycetes Philippinenses. Hedwigia **51**: 306–326.

The greater portion of this paper is devoted to the polyporaceous fungi. There are 102 species included of which eleven are described as new. One new genus, *Elmerina* with *Hexagonia cladophora* Berk., as the type, is described. *Hexagonia vespacea* Pers., is also transferred to this new genus. The new species include *Lentinus elmeri, Cantharellus merrillii, Volvaria esculenta, Fomes pachydermus, Polystictus umbrinus, Poria straminea, P. tricolor, Daedalea gilvidula, Thelephora nigrescens, Cyathus elmeri* and *Cauloglossum saccatum*. These fungi were, to a large extent, collected by E. D. Merrill and A. D. E. Elmer in Mindanao, Negros and Mindoro.

SYDOW, H. and P. Fungi from the Island of Palawan. Leafl. Philip. Bot. 5: 1533–1547.

The twenty-nine species of this list were collected at Puerto Princessa and Brooks' Point, Palawan by A. D. E. Elmer. Of these, twenty-four, or nearly five-sixths, are described as new species. These include:

Puccinia leochroma, Dimerium scabrosum, Nematothecium vinosum, Meliola aliena, M. confragosa, M. diplochaeta, M. elmeri, M. laevigata, M. macròchaeta, M. patens, M. palawanensis, Asterina decipiens, A. irregularis, A. lobata, A. porriginosa, A. trachycarpa, A. transversalis, Micropeltis aequalis, Laestadia festiva, Anthostomella elmeri, Acrospermum latissimum, Calonectria limpida, Vermicularia pandani and *Discosiella cylindrospora.* Two new genera are described, *Nematothecium,* with *N. vinosum,* and *Dioscosiella,* with *D. cylindrospora,* as the type.

1912

SYDOW, H. and P. Novae Fungorum species, VII. Ann. Myc. 10: 77–85.

Eight new species from the Philippines are described, seven

from the vicinity of Manila and one from Bontoc Subprovince, Luzon, as follows: *Ustilago isachnes, U. manilensis, U. rosulata, Tolyposporium philippinense, Puccinia citrata, Meliola gymnosporiae, M. tamarindi,* and *M. callicarpae.*

SYDOW, H. and P. Fungi Exotici Exsiccati, Fasc. I. Ann. Myc. 10: 351–352.

This published list of the fungi distributed in Fascicle I of this series includes fifteen Philippine numbers, five of which are types of new species. The types are as follows: *Meliola tamarindi, Mycosphaerella alocasiae, Gloeosporium graffii, Cercospora pumila,* and *Heterosporium coryphae.*

BRESADOLA, J. Basidiomycetes Philippinenses, II. Hedwigia 53: 46–80.

Of the 168 species listed in this paper there is but one described as the type of a new genus, three as new species and two new varieties. The genus *Copelandia* is described as new with *Agaricus papilionaceus* Bull., as the type. The new species include *Cantharellus philippinensis, Fomes mcgregori* and *Polystictus melanospilus* and the varieties, *Polyporus atypus* Lév., var. *exeratus,* and *Fomes spacideus* (Berk.) Cooke var. *halconensis.* The list represents general collecting from all parts of the Islands and while mostly Polypores other divisions of the Basidiomycetes are represented.

SYDOW, P. and H. Monographia Uredinearum 3: 80.

One new species of Philippine rust is described, *Hamaspora acutissima,* on *Rubus rolfei.* This fungus had previously been collected in Australia and Java but was reported under the name of *Hamaspora longissima* from which it, however, differs sufficiently, according to Sydow, to warrant specific distinction.

1913

BROWN, W. H. and GRAFF, P. W. Factors Influencing Fungus Succession on Dung Cultures. Philip. Journ. Sci. Bot. 8: 21–29.

In this article it is concluded that the succession of fungus life on dung cultures is due to the action of microörganisms rather

than toxins and that this may possibly be a clue to the cause of the succession of higher plants in a given locality. Four species of fungi are mentioned which had not previously been reported from the Islands: *Absidia caerulea* Bain., *Mucor racemosa* Fres., *Coprinus stercorarius* Fr., and *C. plicatilis* Fr.

SYDOW, H. and P. Novae Fungorum Species, IX. Ann. Myc. **11**: 54–65.

In this article which deals mostly with species from Japan and Formosa there are a few from the Caucasus and German East Africa and two new species described from the Philippines. These are *Linospora pandani* on leaves of *Pandanus* sp., and *Gloeosporium catechu* on dead fruits of *Areca catechu*.

REHM, H. Ascomycetes Exsiccati, Fasc. 52. Ann. Myc. **11**: 166–171.

In this fascicle, containing Nos. 2026 to 2050 of Rehm's exsiccati, are distributed two numbers from the Philippines neither of which are new. This is the first Philippine material sent out by Rehm in these sets. The two species are *Sphaerulina smilacincola* Rehm and *Phyllachora pahudiae* Syd., collected in Laguna Province, Luzon.

SYDOW, H. and P. Fungi Exotici Exsiccati, Fasc. II and III. Ann. Myc. **11**: 207–208.

In this list of specimens distributed in Fascicles II and III of this series are included twenty Philippine species. The material of six of these numbers is cotype of new species. These include the following: *Dimerina graffii, Meliola pulcherrima, Mycosphaerella roureae, Asterina cassiae, Hysterostomella psychotriae,* and *Gloeosporium canavaliae.*

REHM, H. Ascomycetes Philippinenses Collecti a Clar. C. F. Baker. Philip. Journ. Sci. Bot. **8**: 181–194.

There are enumerated in this article forty-seven species. Twenty of these are described as new and one as a new variety. All were collected either at Los Baños, Province of Laguna, or on Mount Maquiling in the vicinity. *Trichosphaeria regulinoides* Sacc., var. *arengae* is described as a new variety. The following are described as new species:

Meliola cylindrophora, M. quadrifurcata, Ophionectria erinacea, Phyllachora atrofigurans, Guignardia freycinetia, Sphaerulina smilacincola, Didymosphaeria minutelloides, Merrilliopeltis hoehnelii, Ceratosphaeria philippinarum, Nummularia urceolata, Hypoxylon disjunctum, H. fulvo-ochraceum, Diatrype megale, Seynesia clavispora, Lembosia pothoidei, Ombrophila sanguinea, Humaria raimundoi, and *Lachnea albo-grisea.*

SYDOW, H. and P. Descriptions of Some New Philippine Fungi. Philip. Journ. Sci. Bot. 8: 195–196.

This short paper gives descriptions of five new species of fungi under the following names: *Puccinia paullula, Mycosphaerella alocasiae, Gloeosporium graffii, Cercospora pumila* and *Heterosporium coryphae.* Cotype material of the last four was distributed in Sydow's "Fungi Exotici Exsiccati, Fasc. I."

SYDOW, H. and P. Novae Fungorum Species, X. Ann. Myc. 11: 254–271.

Of the thirty new species of fungi described in this article seven form the types of new genera. Eight of the descriptions are accompanied by text figures. The new Philippine species number thirteen and are as follows:

Graphiola cylindrospora, Meliola pulcherrima (fig.), *M. arborescens* (fig.), *Aithaloderma clavatisporum* (fig.), *Physalospora hoyae, Phyllachora schoenicola, Schizochora elmeri* (fig.), *Cyclodothis pulchella* (fig.), *Diedickea singularis* (fig.), *Gloeosporium hoyae, Coniosporium extremorum, Cercospora stizolobii,* and *C. subtorulosa.*

Aithaloderma, Schizochora, Cyclodothis and *Diedickea* are described as new genera of which the types are Philippine species listed above. A larger portion of the remaining species described in the article are from Japan and hence, from the nearness of the two localities, of considerable interest to one interested in the Philippines or their vicinity.

REHM, H. Ascomycetes Philippinenses, II. Philip. Journ. Sci. Bot. 8: 251–263.

In this article forty-six species of Ascomycetes are listed together with descriptions of seventeen new species. The specimens enumerated were collected in the vicinity of Los Baños, Province of Laguna, Luzon. Those which are described as new include:

Meliola uvariae, M. acalyphae, M. merremiae, M. hewittiae, Dimerium pseudo-perisporioides, Microthyrium elatum, Micropeltis corruscans, Stigmatea cincreomaculans, Leptosphaeria ambiens, Cryptosphaeria philippinensis, Valsaria consors, Botryosphaeria bakeri, Daldinia luzonensis, Xylaria gigantochloae, Lembosia eugeniae, Haematomyces carneus, Ombrophila helotioides and one new variety, *Anthostomella grandispora* Penz. & Sacc., var. *schizostachyi.*

SYDOW, H. and P. Enumeration of Fungi, with Notes and Descriptions of New Species, Part I: Mycromycetes. Philip. Journ. Sci. Bot. 8: 265–285.

Thirty-eight new species of Ascomycetes and Imperfecti are described among this list of 109 species enumerated from the Philippines. One new genus is described and formed by raising *Tephrosticta,* a subgenus of *Trichosporella,* to generic rank. The larger part of the fungous material was collected in the vicinity of Manila, on Mount Maquiling in Laguna Province and Mount Mariveles, Province of Bataan. The new species described in this enumeration include the following:

Microstroma philippinense, Tilletia opaca, Puccinia philippinensis, Meliola intricata, Dimerina graffii, Dimerosporina pusilla, Mycosphaerella pericampyli, M. roureae, Pleosphaerulina phaseolina, Tephrosticta ficina, Ophiobolus seriatus, Anthostomella calocarpa, Rosellinia lamprostoma, Amphisphaeria bambusina, Hypocrea degenerans, Hysterostomella psychotriae, Asterina cassiae, A. laxiuscula, Phyllachora afzeliae, P. dischidiae, P. pahudiae, P. roureae, P. lagunensis, P. sacchari-spontanei, Dothidea pterocarpi, Dothidella albizziae, Phyllosticta bakeri, Septoria bakeri, Lasmenia ficina, Ephelis caricina, Gloeosporium canavaliae, Colletotrichum euchronum, C. pandani, Cercospora gliricidiae, C. bakeri, C. biophyti, C. pantoleuca, and *C. litseae-glutinosae.* Besides these, one new combination is made by the transfer of *Dothidella yapensis* P. Henn., to the genus *Phyllachora.*

SACCARDO, P. A. Notae Mycologicae. Ann. Myc. 11: 312–325.

There are included in this article the enumeration of sixteen species new to the Philippines. Among these are described two new genera, *Traversoa* with *T. excipuloides* as the type and *Stigmatomyces* with *S. bakeri* as type. Aside from these there are described eleven new species:

Phyllosticta siphonodontis, P. graffiana, Macrophoma punctiformis, M. seriata, Traversoa dothiorelloides, Botryodiplodia anceps, Diplodia durionis, Coniosporium liniolatum, Podosporium gigasporum, Aspergillus periconioides and *Stigmella manilensis;* and two new varieties; *Traversoa excipuloides* var. *distans,* and *Pestalozzia microspora* var. *philippinensis.* All the species enumerated in the article were collected on the island of Luzon.

SYDOW, H. and P. Fungi Exotici Exsiccati, Fasc. IV. Ann. Myc. 11: 388.

In this list of fifty numbers, distributed as Fascicle IV of Sydow's exsiccati, nineteen are from the Philippines and of these one is cotype of a new genus and eight of new species. These include the following:

Aithaloderma clavatisporum nov. gen. and sp., *Microstroma philippinense, Anthostomella calocarpa, Phyllachora roureae, Gloeosporium lebbeck, Colletotrichum pandani, Aspergillus periconioides, Trichosporium olivatum,* and *Stigmella manilensis.*

SYDOW, H. and P. Notes and Descriptions of Philippine Fungi, II. Leafl. Philip. Bot. 6: 1919–1933.

There are included in this enumeration forty-five species collected by A. D. E. Elmer, mostly from the islands of Palawan and Mindanao. Fourteen of these are Basidiomycetes one of which, *Septobasidium molliusculum,* is described as a new species. Twenty-eight are Ascomycetes, among which are described two new genera, *Schizochora* with *S. elmeri* and *Cyclodothis* with *C. pulchella* as types, and thirteen additional new species.

The remaining three are listed as Fungi Imperfecti. Here one new genus is described, *Diedickea* with *D. singularis* as the type, and *Marsonia pavonia* is described as a new species. The new Ascomycetes include:

Meliola acutisecta, M. affinis, M. araneosa, M. arborescens, M. heterotricha, M. opaca, M. opposita, M. parvula, M. vilis, Asterina opposita, A. subinermis, Phyllachora oblongispora, Cyclodothis pulchella, and *Acrospermum elmeri.*

REHM, H. Ascomycetes Exsiccati, Fasc. 53. Ann. Myc. 11: 391–395.

In this fascicle, containing No. 2051 to 2075 of Rehm's exsiccati, are distributed eight species from the Philippines collected on the island of Luzon. None represent new species.

SYDOW, H. and P. Novae Fungorum Species, XI. Ann. Myc. 11: 402–408.

In this article, in which are described eighteen new species of micromycetous fungi, eleven are from the Philippines. One new genus, *Micropeltella* with *M. clavispora* as the type, is described from material collected on *Memecyclon lanceolatum* from Pangasinan, Luzon. The other ten new species are as follows:

Aecidium banosense, Mycosphaerella oculata, M. caricae, Venturia litseae, Microthyriella philippinensis, Macrophoma cyamopsidis, Gloeosporium alchorneae, Cercosporina barringtoniae C. carthami, and *C. taccae.* These ten species were all collected in the vicinity of Los Baños, Province of Laguna, Luzon.

GRAFF, P. W. Additions to the Basidiomycetous Flora of the Philippines. Philip. Journ. Sci. Bot. 8: 299–307, *pl. 8–10.*

An enumeration of Philippine Basidiomycetes divided as follows; Tremellineae, two species one of which, *Exidia lagunensis,* is described as new: Polyporeae, eight species with one, *Laschia philippinensis,* described as new; Agaricineae, seven species with four, *Lentinus candidus, L. lagunensis, Volvaria pruinosa* and *Naucoria manilensis,* new; Gasteromyceteae, sixteen with one new species, *Bovista jonesii.* Of thirty-three species, seven are described as new and three of these, *Lentinus candidus, L. lagunensis* and *Volvaria pruinosa* are illustrated by plates.

REHM, H. Ascomycetes Philippinenses, III. Philip. Journ. Sci. Bot. 8: 391–405.

Ffty-two species are included in this enumeration, all from the island of Luzon. Of these, twenty-five are described as new:

Meliola sandorici, M. sidae, M. maesae, M. telosmae, M. horrida, Myiocopron bakerianum, Micropeltis consimilis, M. applanata, Limacinula malloti, Lisea spatholobi, Auerswaldia decipiens, Phyllachora lagunae, P. pseudes, P. pterocarpi, P. valsiformis, Dothidella canarii, Anthostomella mindorensis, A. donacina, Apiosporella coryphae, Hypoxylon coryphae, Metasphaeria maculans, Melanomma mindorense, Lophodermium passiflorae, Coccomyces canarii and *Biatorina sublutea.* Several new varieties are also included, as follows; *Micropeltis vagabunda* Speg. var. *calamincola, Apiospora curvispora* (Speg.) Rehm var. *rottboelliae, Stictis stellata* Wallr., var. *philippinensis, Psorotheciopsis decipiens* Rehm var. *bispora,* and *Humaria granulata* (Bull.) Quél., var. *microspora.*

REHM, H. Ascomycetes Philippinenses, IV. Leafl. Philip. Bot. 6: 1935–1947.

Of forty species which are enumerated here, thirteen are described as new. All were collected by C. F. Baker in the vicinity of Los Baños, Province of Laguna, Luzon. The new species include the following:

Nectriella philippina, Rhopographus blumeanus, Rosellinia fuscomaculans, Zignoella arengae, Rhynchostoma sanguineo-atrum, Didymosphaeria blumeae, Metasphaeria raimundoi, Amphisphaeria leucaenae, Eutypa macropunctata,

Hypoxylon lianincolum, Vizella passiflorae, Micropeltis bauhiniae, and *Scolecopeltis garciniae.* With the exception of two species belonging to the Discomycetes, all listed belong to the Pyrenomycetes.

SACCARDO, P. A. Notae Mycologicae. Ann. Myc. 11: 546–568.

Included in this article are notes and comments on twenty-five species of Philippine fungi gathered by several collectors in a number of localities on the island of Luzon. Among these one new genus is described, *Melanographium* with *M. spleniosporum* on *Bambusa blumeana* as the type. The remaining new species are twelve in number and include:

Cryptovalsa philippinensis, Phoma sabdariffae, Phomopsis dioscoreae, Dothiorella crastophila, Haplosporella manilensis, Diplodia synedrellae, D. caricae, D. artocarpi, Botryodiplodia curta, Campsotrichum heterochaetum, Helminthosporium inversum, and *Hymenula copelandi.*

1914

BAKER, C. F. The Lower Fungi of the Philippine Islands. Leafl. Philip. Bot. 6: 2065–2190.

This publication includes a very complete check-list of the micromycetous fungi reported from the Islands and, while many corrections must be made in a future work of the kind, it will undoubtedly prove of great assistance in any work on the subject. In it some 215 genera and 638 species are listed. A considerable percentage of these have been added to the known flora of the Archipelago but recently. Ricker, in 1906, reports but 71 genera and 156 species in all groups of fungi then known from the Philippines.

SYDOW, H. and P. Enumeration of Philippine Fungi with Notes and Descriptions of New Species, II. Philip. Journ. Sci. Bot. 8: 475–508.

This extensive enumeration of lower forms of Philippine fungi includes a list of 129 species, fifty of which are described as new. Four new genera are described under the following names: *Bulgariastrum, Calopeziza, Sirosphaera* and *Lasiothyrium.* The collectors were several and the fungi gathered in a number of localities throughout the Archipelago. The larger portion, however, were collected on the island of Luzon. The new species described include:

Puccinia erebia, Uredo operculinae, U. nerviseda, Aecidium lagunense, Dimeriella cyathearum, Meliola mitragynes, M. merrillii, M. peregrina, M. perpusilla, M. pelliculosa, Guignardia creberrima, Hypospila ambigua, Merrilliopeltis daemonoropsis, Anthostomella discophora, Rosellinia megalosperma, R. merrillii, Apiosporella aberrans, Diatrypella psidii, Micropeltella megasperma, Micropeltis semecarpi, Seynesia ipomoeae, Asterina pusilla, Asterinella obesa, A. loranthi, A. luzonensis, A. lugubris, A. distinguenda, Trichothyrium orbiculare, Gibberella creberrima, Hypocrella melaena, Phyllachora phaseolina, P. rottboelliae, Discodothis lobata, Glonium bambusinum, Bulgariastrum caespitosum, Calopeziza mirabilis, Dasyscypha merrillii, Erinnella philippinensis, Phyllosticta manihoticola, Phomopsis bakeri, P. gliricidiae, Sirosphaera botryosa, Leptothyrium circumcissum, Pycnothyrium lobatum, Lasiothyrium cycloschizon, Gloeosporium lebbeck, Cylindrosporium exiguum, Melanconium merrillii, Oospora obducens, Catenularia velutina, Cladosporium oplismeni, and *Cereospora tabernaemontanae.*

THAXTER, ROLAND. Laboulbeniales Parasitic on Chrysomelidae. Proc. Amer. Acad. Arts Sci. **50**: 17–50.

Among thirty-four species of these curious and interesting fungi, all but three of which are described as new and nearly all of which were collected in tropical countries, are included three from the Philippines. Two of these *Laboulbenia philippina* on a chrysomelid near *Rhembastus* and *L. oedionychi* on *Oedionychus* sp., both collected by C. S. Banks in the vicinity of Manila, are described as new species. The other is a previously described species, *L. nodostomae,* and was collected on *Nodostoma* sp., on the island of Mindanao.

REHM, H. Ascomycetes Exsiccati, Fasc. 54 and 55. Ann. Myc. **12**: 165–175.

Among these notes and descriptions of new species distributed in these fascicles, fourteen are enumerated from the Philippines. None of these are new species but are previously described and from the following genera: *Meliola* 5, *Didymosphaeria* 1, *Trichosphaeria* 1, *Paranectria* 1, *Merrilliopeltis* 1, *Gilletiella* 1, *Asterina* 3, and *Calopeziza* 1.

SYDOW, H. and P. Novae Fungorum Species, XII. Ann. Myc. **12**: 195–204.

Of the thirty-two new species described here, twenty-one are of Philippine origin. Among these is described one new genus, *Theissenula,* with *T. clavispora* on *Schizostachyum acutiflorum* as the type. The other new species include:

Septobasidium minutulum, Kuehneola garugae, Coleosporium exaci, Aecidium parile, Entyloma oryzae, Mycosphaerella brideliae, M. reyesi Gnomonia litseae, Myiocopron conjunctum, Lophodermium rotundatum, Brachysporium bakeri, Cercospora alpiniae, C. artocarpi, C. bauhiniae, C. canavaliae, C. lagerstromiae, C. pachyderma, C. pahudiae, C. puerariae, and *Sporodesmium bakeri.*

SYDOW, H. and P. Fungi Exotici Exsiccati, Fasc. V and VI. Ann. Myc. 12: 238–239.

In this list of a hundred numbers distributed in these two fascicles twenty-eight are from the Philippines. Of these the following: *Uredo operculinae, Meliola pelliculosa, Guignardia creberrima, Phyllachora sacchari-spontanei,* and *Asterina laxiuscula,* are cotype material of new species. Three numbers are cotype of new Philippine genera, as follows: *Diplochorella fertilissima* on *Xylopia aethiopica, Calopeziza mirabilis* on *Premna odorata,* and *Lasiothyrium cycloschizon* on *Aegiceras corniculatus.*

REHM, H. Ascomycetes Philippinenses, V. Leafl. Philip. Bot. 6: 2191–2237.

Over one third of this enumeration of 130 species of Philippine Ascomycetes consists in the description of new ones. These, numbering fifty-four, are described under the following names:

Meliola callista, M. uncariae, Guignardia sterculiae, G. fuscocoriacea, G. arengae, Anthostomella atronitens, A. copelandi, A. lichenoides, Rosellinia rachidis, Massarinula cordiae, Amphisphaeria clerodendri, A. coronata, Metasphaeria abundans, M. consociata, M. hibiscincola, M. gigantochloae, Herpotrichia philippinensis, Leptosphaeria simillima, Clypeosphaeria gigantochloae, Ustulina placentiformis, Nummularia papyracea, Poronia hypoxyloides, Xylaria bacillaris, Calosphaeria inconspicua, Eutypella premnae, Eutypa slangii, E. capparidis, Diatrype clerodendri, Anthostoma flagellariae, Valsaria discoidea, V. colludens, Holstiella eutypa, Kalmusia philippinarum, Phyllachora congruens, P. atronitens, P. orbicula, P. donacina, Phaeodothis gigantochloae, Scirrhia gigantochloae, Rhopographella reyesiana, Trichonectria bambusicola, Seynesia alstoniae, Asterina lophopetali, Micropeltis aeruginaceus, M. pometiae, Lophodermium passiflorae, L. aleuritis, L. reyesianum, Humaria conformis, Plicaria bananincola, Trichaleurina polytricha, Linhartia luzonica, L. philippinensis, and *Bilimbia rhapidophylli.*

Aside from these new species, there are described eleven new varieties. All of this material was collected in the vicinity of Los Baños, Province of Laguna.

PATOUILLARD, N. Champignons des Philippines, I. Leafl. Philip. Bot. 6: 2239–2255.

An enumeration of seventy-seven Basidiomycetes communicated by C. F. Baker. Of these, seven are described as new species as follows:

Septobasidium bakeri, Hexagona reyesii, Hydnum insulare, H. copelandii, Laschia simulans, Dictyopanus copelandii and *Porolaschia raimundoi.* Three new forms of *Hexagona thwaitesii* are described, *sinuata, resupinata,* and *retropicta* respectively. The collections were all made in the vicinity of Los Baños, Province of Laguna, Luzon.

SYDOW, H. and P. Fungi from Northern Palawan. Philip. Journ. Sci. Bot. 9: 157–189.

This enumeration represents the results of a collection made by E. D. Merrill on the island of Palawan, largely in the vicinity of Taytay and Lake Manguao, during April and May, 1913. There are included 110 species. Among these are described nine new genera with the following as types:

Microdothella culmicola, Heterodothis leptotheca, Palawania grandis, Stigmatodothis palawanensis, Actinodothis piperis, Aulacostroma palawanense, Stephanotheca micromera, Phellostroma hypoxyloides and *Ischnostroma merrillii.*

Also there are described as new the following thirty-nine species: *Septobasidium subolivaceum, Meliola aglaiae, Balladyna melodori, Dimerosporina dinochloa, Henningsomyces philippinensis, H. pusillimus, Peroneutypella graphidioides, P. arecae, Didymella acutata, D. pandanicola, Merrilliopeltis parvula, Ophiobolus licualae, Anthostomella, bicincta, A. cocoina, Rosellinia truncata, Amphisphaeria palawanensis, Melanomma philippinense, Phyllachora connari, Palawania cocoës, Dictyothyrium giganteum, Micropeltella merrillii, Asterina nodulifera, A. dilleniae, A. lobulifera, Asterinella palawanensis, A. ramuligera, A. calami, Lembosia nervisequia, L. inconspicua, Morenoëlla memecyli, Phomopsis arecae, Centhospora garciniae, Pycnothyrium pandani, Aschersonia macularis, Colletotrichum arecae, Cereospora licualae, Cercosporina helicteris, Stigmella palawanensis,* and *Exosporium calophylli.*

GRAFF, P. W. Philippine Basidiomycetes, II. Philip. Journ. Sci. Bot. 9: 235–254, *pl. 2.*

This article contains an enumeration of sixty-eight species of Basidiomycetes divided among the various groups as follows: Tremellineae 3, Thelephoreae 2, Polyporeae 22, Agaricineae 31, and Gasteromyceteae 9. Among these are described the following six new species: *Lepiota sulphopenita, Tricholoma tenuis,*

Lentinus macgregorii, Agaricus luzonensis, Stropharia radicata, and *Coprinus flos-lactus.*

Lepiota pulcherrima is suggested as a *nomen novum* to replace Morgan's *L. candida,* which is antedated by Copeland's Philippine species of the same name. Several new combinations are also made including *Polyporus benguetensis, Fomes subchinoneus, F. unguliformis* and *Trametes elmeri. Lentinus macgregori* is illustrated by a plate.

REHM, H. Ascomycetes Philippinenses, VI. Leafl. Philip. Bot. **6**: 2257–2281.

The eighty-three species enumerated in this article were collected on Mount Maquiling, Mount Banajao and in the vicinity of Los Baños in Laguna Province, Luzon. In the Stictidiaceae, one new genus is described, *Propoliopsis,* with *P. arengae* on *Arenga saccharifera* as the type. The following thirty-four species are also described as new:

Guignardia albicans, Otthiella cyathoidea, Lentomita philippinensis, Anthostomella donacis, A. sacchariferae, Amphisphaeria schizostachyi, A. notabilis, Metasphaeria pseudostromatica, Massaria raimundoi, M. nigroviridula, Acerbia donacina, Allescherina strebli, Eutypa megalosoma, E. inconspicua, Eutypella leucaenae, Diatrype polygoneia, D. albizziae, Peroneutypa discriminis, P. philippinarum, Peroneutypella adelphica, P. cypheloides, Diaporthe citrincola, Valsaria strebli, V. citri, Hypoxylon nummularioides, Auerswaldia pandani, A. lophiostomacea, Nectriella ptychospermatis, Hypocrea mellea, Gillotiella latemaculans, Cenangella gliricidiae, Propoliopsis arengae, Dasyscypha cyathea, and *Urnula philippinarum.*

SACCARDO, P. A. Fungi Philippinenses, in Notae Mycologicae. Ann. Myc. **12**: 303–314.

Of the fifty-three species enumerated from the Philippines the larger portion are described as new. One new genus is described, *Pirostomella,* with *P. raimundi* on *Ficus nota* as type. There are also described forty-one new species. These include:

Dimerosporium lussoniense, Guignardia manihoti, Rosellinia umbilicata, Didymella lussoniensis, Metasphaeria reyesii, Ophiobolus graffianus, Phyllosticta circumsepta, Phoma sesamina, P. bakeriana, P. fallaciosa, Phomopsis myriostica, Cytospora aberrans, Vermicularia fallax, V. horridula, V. breviseta, V. merrilliana, V. sesamina, Diplodia ricinicola, D. daturae, D. artocarpina, D. coicis, D. phaseolina, D. manihoti, D. solanicola, D. moringae, Hendersonia coicis, Stagonospora varians, Gloeosporium macrophomoides, G. aleuriticum, Colletotrichum lussoniense, Pestalozzia pauciseta, Dendrodochium lus-

soniense, Cercosporella uredinophila, Goniosporium unilaterale, Dichotomella areolata, Sarcinella raimundi, Helminthosporium caryopsidum, Cladosporium lineolatum, Cercospora bakeriana, C. lussoniensis, and *Torula anisospora.*

BAKER, C. F. The Lower Fungi of the Philippine Islands. Leafl. Philip. Bot. 7: 2417–2542.

This extensive check-list appears as a supplement to one previously published by the same author in Elmer's "Leaflets" at the beginning of the year. To the 638 species listed in the previous report, the addition is made of 320, bringing the total of these forms known from the Islands up to 958 species. This large addition in so short a time shows an indication of the possibilities for the future, when more complete and extended collections have been made, of a very extensive fungous flora. An additional host-index is appended to the article.

BRESADOLA, G. and SYDOW, H. Enumeration of Philippine Basidiomycetes. Philip. Journ. Sci. Bot. 9: 345–352.

Among the ninety-three species listed but two are described as new. The specimens were collected in various parts of the Islands and by a number of collectors. Both new species belong to the genus *Hymenochaete* and under the names *H. subferruginea* and *H. deflectens.*

SYDOW, H. and P. Diagnosen neuer philippinischer Pilze. Ann. Myc. 12: 545–576.

The diagnoses of sixty-five new species are given and with them appear also eight new genera. The following are described as the types of new genera: *Rizalia fasciculata* on leaves of *Diospyros* sp., *Meliolina radians* on leaves of *Eugenia xanthophyllum, Pycnoderma bambusinum* on leaves of *Bambusa vulgaris, Angatia eugeniae* on leaves of *Eugenia perpallida, Odontoschizon parvulum* on leaves of *Quercus ovalis, Manilaea bambusina* on dead culms of *Bambusa blumeana, Exotrichum leucomelas* on living leaves of *Sumbavia rottleroides* and *Psalidosperma mirabile* on leaves of *Mitrephora* sp.

Aside from these the species described as new include:

Septobasidium phyllophilum Aithaloderma longisetum, Balladyna uncinata, Meliola subapoda, M. hamata, M. sacchari, M. fagraeae, M. champereiae, M. linocierae, M. canarii, M. gliricidiae, M. bataanensis, M. scaevolae, M. rizal-

ensis, M. ramosii, M. panicicola, M. micromera, Physalospora bullata, Mycosphaerella ditissima, M. aristolochiae, Chaetosphaeria meliolicola, Acanthostigma vilae, Asterina anisopterae, A. camarinensis, A. densa, A. grammocarpa, A oligocarpa, Asterinella anamirtae, A. dipterocarpi, A. gracilis, Morenoëlla anisocarpa, M. anisopterae, M. lagunensis, M. ramosii, M. tenuis, Lembosia decolorans, Microthyrium imperatae, Micropeltella camarinensis, M. ramosii, Pycnocarpon nodulosum, P. fimbriatum, Hypomyces sulphureus, Phyllachora premnae, Telimena graminella, Ellisiodothis pandani, Uleopeltis bambusina, Myriangium philippinense, Taphrina linearis, Coccomyces memecycli, Phyllosticta sumbaviae, Macrophoma euphorbiae, Psalidosperma mirabile, Pirostomella major, Gloeosporium merrillii, Colletotrichum sumbaviae, Cercospora macarangae, Vermicularia ananassae and *Microcera merrillii. Meliola cladotricha, M. pulcherrima,* and *M. arborescens* are transferred to the genus *Meliolina.*

1915

SYDOW, H. and P. Fungi Exotici Exsiccati, Fasc. VII–IX. Ann. Myc. 13: 68–70.

Of the 150 numbers issued in these three fascicles, one half are Philippine specimens. Four numbers are cotype material of new genera. *Aulacostroma palawanense* on *Pandanus Merrillii* and *P. tectorius, Pycnoderma bambusinum* on *Bambusa vulgaris* and *Schizostachyum* sp., *Exotrichum leucomelas* on *Sumbavia rottleroides* and *Ischnostroma merrillii* on *Talauma* sp. Cotype material of new species are also represented in generous numbers. Of these twenty-one appear under the following names:

Mohortia drepanoclada, Aithaloderma longisetum, Balladyna uncinata, Meliola champereiae, M. linocierae, M. ramosii, M. rizalensis, Chaetosphaeria meliolicola, Telimena graminella, Pycnocarpon nodulosum, Micropeltella ramosii, Microthyrium imperatae, Lembosia decolorans, L. inconspicua, Asterina densa, A. oligocarpa, Asterinella gracilis, Taphrina linearis, Phyllosticta sumbaviae, Ceuthospora garciniae, and *Cercosporella uredinophila.*

BRESADOLA, J. Basidiomycetes Philippinenses, III. Hedwigia 41: 289–308.

This third article of Bresadola's series includes an enumeration of 101 species of Basidiomycetes and has appended eight species of Ascomycetes and two Hyphomycetes. Among the Basidiomycetes the following twenty-two are described as new:

Panus murinus, Xerotus vinoso-fuscus, Polyporus spadiceus, P. graffianus, P. crustulinus, P. fusco-badius, Fomes fusco-pallens, F. validus, Poria lurida, P. porphyrophaea, Hexagonia umbrina, Grammothele cineracea, G. delicata, Hymenochaete variegata, H. mollis, H. livens, Veluticeps philippinensis, Corticium hinnuleum, Gloeocystidium lacticolor, Septobasidium merrillii, Pterula

fructicola, and *Heterochaete pallida.* Two species of Ascomycetes are also described as new under the names *Eutypa polygramma* and *Nummularia merrillii.*

PATOUILLARD, N. Champignons des Philippines Communiqués par C. F. Baker, II. Philip. Journ. Sci. Bot. 10: 85–98.

An enumeration of ninety-four species is included in this article. Among these one new genus appears, *Duportella,* with two new species, *V. velutina* and *D. raimundoi,* under it. Ten other species are also described as new including:

Septobasidium laxum, Hymenochaete pavonia, Leucoporus ameides, Leptoporus armatus, Hexagona lachnochaeta, Elmerina foliacea, Daedalea philippinensis, Ganoderma bakeri, G. plicatum, and *Crinipellis fragilis.* The specimens listed were all collected in the Province of Laguna, Luzon.

SACCARDO, P. A. Fungi Philippinenses, in Notae Mycologicae. Ann. Myc. 13: 126–128.

Notes on eight Philippine species are here given. Of these, seven, *Uredo claoxyll, Limacinia biseptata, Microxyphium dubium, Didymosphaeria caespitulosa, Massarinula obliqua, Rhabdospora synedrellae* and *Illosporium tabacinum* are described as new. The eighth is described as a new form under the name *Phomopsis palmicola* (Wint.) Sacc. forma *arecae.*

THEISSEN, F. and SYDOW, H. Die Dothideales. Ann. Myc. 13: 149–746, *pl. 1–6.*

In this monograph of the Dothideales, Theissen and Sydow cite numerous species as being found in the Philippines. Among these should be noted the following, *Darwinella orbicula* is made the type of a new genus, *Elmerococcum, Roumegueria ichnanthi* is made the type of the new genus *Phragmocarpella* to which *Homostegia fusispora* is also transferred and *Munkiodothis* is described as a new genus with *M. melastomata* from Java and the Philippines as the type. The genus *Catacauma* receives the following: *C. circinata, C. elmeri, C. lagunensis, C. valsiforme, C. apoënse, C. sanguineum, C. aspideum* and *C. pterocarpi,* which are transferred from the genus *Phyllachora. Catacauma garciae, Trabutia vernicosa,* and *T. elmeri* are described as new species from the Philippines.

A number of Philippine species hitherto assigned to this group

are excluded. The species *Auerswaldia decipiens, A. pandani, A. gigantochloae, Dothidella derridis, Scirrhia luzonensis,* and *Phaeodothis gigantochloae* are said to belong to the Sphaeriales. *Hysterostomella alsophilae* and *Gilletiella late-maculans* are also excluded, the former being a Discomycete and the latter a Lichen.

REHM, H. Ascomycetes Philippinenses, VII. Leafl. Philip. Bot. 8: 2921–2933.

The seventh contribution of this series presents a list of thirty-three species and contains descriptions of seventeen which are described as new. These include:

Hypoxylina philippinensis, Nectria flavido-carnea, N. leucaenae, Broomella zeae, Paranectria luxurians, Lophodermium planchoniae, L. aleuritis, Coccomyces dubius, Briardia maquilingiana, Cenangium blumeanum, Lagerheima dermatoidea, Niptera grewiae, Trichobelonium melioloides, Pezizella ombrophilacea, Humaria caballina, Plicaria tropica, and *Lembosia pandani.*

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MYCOLOGIA

VOL. VIII NOVEMBER, 1916 No. 6

FUNGI COLLECTED AT ARKVILLE, NEW YORK

WILLIAM A. MURRILL

While spending a vacation of two weeks at Arkville, August 6–20, 1916, I took daily excursions into the surrounding forests and secured a very representative collection of the fleshy fungous flora of the region for that season of the year. If a similar collection could be secured during late September, many other species, particularly in the rusty-spored and brown-spored groups, would undoubtedly be added to the list here published.

Arkville is a small village in the edge of Delaware County at the southwest corner of the Catskill region. Mt. Pakatakan, 3,000 feet above sea-level, overlooks the village on the south, while a lower range called the Hogback rises precipitously to the north. The headwaters of the Delaware River are in these and neighboring mountains, the elevation of the valleys around Arkville being about 1,400 feet. Arkville is interesting to many botanists in New York City because it is included within the local flora range.

The principal forest trees of the region are hemlock, sugar maple, beech, yellow birch, butternut, white elm, ash, hop hornbeam, linden, red maple, and aspen. A few chestnuts are found on Hogback, but these will soon be exterminated by the canker, which is spreading rapidly through the Catskills from the Ashokan Reservoir region. Several of the aspens were found to be seriously attacked by the poplar canker. A local wood alcohol plant consumes fifteen cords of wood daily. Practically all the

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north side of Mt. Pakatakan has been denuded of its original forests, but on some small estates near the base of the mountain and in a few deep ravines stretches of virgin timber remain which contain old beeches and sugar maples and hemlocks of unusual size.

In comparing the forests about Arkville with those of Lake Placid and the Upper St. Regis, the most striking difference is the absence in the Arkville region of balsam and spruce and all other conifers except hemlock, and the relatively greater abundance of deciduous trees. This would indicate the absence of certain fungous elements which are common in the Adirondacks and a larger proportion of species found about New York City. It may well be true that the fungous flora of the Catskills taken as a whole is very similar to that of the Adirondacks, but this general statement would hardly apply to Arkville without modification. Peck's Catskill collections were mostly obtained from Phoenicia, Tannersville, Haines Falls, Summit, and neighboring stations in the eastern part of the Catskills.

If sphagnum bogs occur at Arkville, I did not happen to find one, but there is a remarkable development of *Polytrichum commune* on Hogback, where many species of *Hygrophorus* and other species of moss-loving fungi were found. *Clavaria fusiformis* occurred there in much greater abundance than I have ever before seen it.

Mrs. Margaret H. Newton, of the Pakatakan Inn, where Mrs. Murrill and I established our headquarters, very generously afforded us every facility for drying and caring for the specimens, while a large number of the guests became interested in hunting for fungi and aided us materially in building up the collection. The following deserve special mention and our best thanks: Miss Clara Grass, Miss Margaret Grass, Miss Lisetta Arlitz, Miss Marian Forsyth, Miss M. E. McOuat, Mr. Gerald Taber, Mr. James Hopkins, Mr. Marvin Tappan, Fraulein Fuchs, Mr. and Mrs. Charles Petrie, Mrs. Clark, Miss Wiggins, Miss Eleanor Browning, Miss Martha Harlow, Miss Shannon, and Miss Marguerite Budd.

In the following list, the abundance of a given species as observed during my stay at Arkville is indicated by an exponent, the

numerals 1–5 denoting a definite number of times collected and the letters *n, nn,* and *nnn* meaning "frequent," "common," and "very common," respectively. Critical species of *Marasmius* were referred to Dr. Pennington and the discomycetes to Dr. Seaver for determination.

A. ASCOMYCETES

Ciboria nebulosa[1]
Cudonia lutea[2]
Cytospora chrysosperma[1]
Daldinia concentrica[3]
Galactinia succosa[1]?
Helotium citrinum[n]
Hypomyces apiculatus[1]
Hypomyces hyalinus[n]
Hypomyces lactifluorum[n]
Lachnea lusatiae[1]
Lachnea scutellata[n]
Lasiosphaeria hispida[1]
Leotia lubrica[2]
Macropodia macropus[2]
Macropodia fuscicarpa[1]
Microglossum rufum[2]
Neotiella albocincta[1]
Otidea alutacea[1]?
Peziza repanda[1]
Podostroma alutacea[1]
Tapesia fusca[1]
Xylaria Hypoxylon[n]
Xylaria polymorpha[n]

B. HYMENOMYCETES

(*a*) TREMELLALES

Gyrocephalus rufus[1]. On leaf-mold in a forest road.
Tremella lutescens[2]
Tremellodon gelatinosum[3]

(*b*) AGARICALES

1. Thelephoraceae

Craterellus Cantharellus[1]. Found in large quantity near West Hurley by Miss M. E. McOuat, but not seen at Arkville. The odor on drying is similar to that of *Chanterel Chantarellus.*
Craterellus cornucopioides[2]
Lachnocladium Micheneri[n]
Lachnocladium Schweinitzii[n]
Peniophora cinerea[n]
Stereum lobatum[2]
Stereum rugosum[1]. On a sugar maple log.
Stereum sericeum[n]

2. Clavariaceae

Clavaria cristata[n]
Clavaria fusiformis[nnn]. Abundant in *Polytrichum commune* and other mosses on Hogback.
Clavaria Kunzei[n]? A delicate, pure-white species found in hair-cap moss. Dr. Coker says this is labeled *C. Kunzei* at Albany, but that European specimens appear different.
Physalacria inflata[2]

3. Hydnaceae

Hydnum repandum[nn]

4. Polyporaceae

Bjerkandera adusta[n]
Cerrena unicolor[n]
Coltricia cinnamomea[3]
Coltricia perennis[4]
Coriolus abietinus[n]
Coriolus nigromarginatus[n]
Coriolus versicolor[nnn]
Daedalea confragosa[n]
Elfvingia fomentaria[n]. On aspen, as well as on beech and birch.
Elfvingia megaloma[nn]
Fomes populinus[2]. Found once on sugar maple and once on beech, the latter tree being a very rare host.
Fomes ungulatus[n]
Ganoderma Tsugae[nn]
Gloeophyllum hirsutum[nn]
Grifola Berkeleyi[1]. A single large cluster was found by Mrs. Clark. A few red oaks occur at Arkville and this tree was probably the host.
Hapalopilus rutilans[1]
Hexagona alveolaris[n]
Hexagona striatula[3]
Irpiciporus lacteus[n]
Lenzites betulina[1]
Polyporus elegans[n]
Polyporus fagicola[1]. On a fallen beech limb in woods. More than twice as large as the type specimen found on the top of a beech log in Maine, and not showing a radial arrangement of fibrils. This is the second time the species has been collected.
Poronidulus conchifer. On fallen elm branches.
Pycnoporus cinnabarinus[1]
Pyropolyporus conchatus[1]. On a sugar maple log.
Pyropolyporus igniarius[4]. On hop hornbeam, butternut, and elm, but not seen either on birch or beech.
Tyromyces chioneus[3]
Tyromyces guttulatus[1]. On a hemlock log.
Tyromyces semipileatus[n]

5. Boletaceae

Boletinellus porosus[1]. In a moist forest road on Mt. Pakatakan at about 2,000 ft. elevation.
Ceriomyces bicolor[2]
Ceriomyces communis[n]
Ceriomyces illudens[1]
Ceriomyces retipes[nn]. Only the typical yellow form was found.
Ceriomyces viscidus[1]
Gyroporus castaneus[n]
Gyroporus cyanescens[1]. On a roadside bank in a rather exposed position.
Strobilomyces strobilaceus[n]

Suillellus luridus[n]

Tylopilus felleus[n]

Tylopilus gracilis[1]

6. Agaricaceae

Twenty or more rosy-spored species and a dozen with rusty spores are not listed here because these groups are being overhauled for *North American Flora.*

Agaricus campestris[nn]. This species is usually common in the meadows about Arkville in September. It had not yet appeared when I was there.

Agaricus placomyces[1]

Camarophyllus basidiosus[1]

Camarophyllus Cantharellus[n]

Camarophyllus pallidus[1]

Chanterel Chantarellus[2]

Chanterel floccosus[1]

Chanterel infundibuliformis[1]. Found in great abundance on a hillside in beech and sugar maple woods. This variety was very dark, resembling *Craterellus cornucopioides* both in form and color, but having distinct lamellae.

Clitocybe adirondackensis[2]

Clitocybe eccentrica[1]

Clitocybe infundibuliformis[n]

Clitocybe lactariiformis[2]

Coprinus atramentarius silvestris[2]. This species occurred at the base of sugar maples in woods.

Coprinus micaceus[3]

Cortinarius armillatus[1]

Cortinarius semisanguineus[1]

Crepidopus ostreatus[n]. A quantity was found on a single sugar maple stump sufficient to serve twenty persons at lunch.

Crepidotus calolepis[1]

Galactopus succosus[2]

Galera Hypnorum[2]

Galera tener[3]

Geopetalum sp.

Gymnopus chrysopeplus[2]

Gymnopus dryophilus[n]

Gymnopus myriadophyllus[1]

Gymnopus oculus[1]

Gymnopus platyphyllus[n]

Gymnopus radicatus[nnn]. All forms of this species were represented. Beech seems to be its favorite tree.

Hydrocybe ceracea[n]

Hydrocybe chlorophana[n]

Hydrocybe flammea[n]

Hydrocybe laeta[n]

Hydrocybe miniata[n]

Hydrocybe nitida[1]

Hydrocybe Peckii[1]

Hydrocybe puniceal[1]

Hypholoma appendiculatum[n]*?* On fallen branches in woods.

Inocybe spp. Only a half dozen or more species were found. *Inocybe geophylla* was collected twice.

Laccaria laccata[4]

Laccaria striatula[3]

Lactaria cinerea[3]

Lactaria Hibbardae[2]

Lactaria hygrophoroides[nn]

Lactaria lactiflua[2]

Lactaria lignyota[1]

Lactaria piperata[nnn]. Frequently parasitized by *Hypomyces Lactiflorum.*

Lactaria subdulcis[n]

Lentinus carneotomentosus[1]

Marasmius alliatus[2]

Marasmius caryophylleus[3]

Marasmius confluens[n]

Marasmius delectans[2]

Marasmius dichrous[2]

Marasmius foetidus[3]

Marasmius glabellus[2]

Marasmius resinosus[nn]

Marasmius rotula[nnn]

Marasmius siccus[n]

Marasmius subnudus[1]

Melanoleuca albissima[n]. Growing in large groups under hemlocks. The specimens were invariably bitter.

Melanoleuca alboflavida[1]. In an open field. The single specimen found is not typical, having points in common with *M. melaleuca.*

Melanoleuca melaleuca[1]

Omphalina chrysophylla[1]

Omphalopsis campanella[nnn]

Omphalopsis fibula[2]

Panaeolus campanulatus[2]. In pastures.

Panellus stypticus[1]

Paxillus involutus[1]. The unusual scarcity of this species may have been due to the season. Very few rusty-spored agarics of any kind were found during my stay.

Phylloporus rhodoxanthus[1]

Pleurotus dimidiatus[1]. In a hollow sugar maple stump.

Prunulus cyaneobasis[1]

Prunulus Leaianus[1]

Russula bifida[nn]. Found especially under beech trees. The color varied from green to dark-mottled-greenish, and the lamellae were conspicuously forked.

Russula brunneola[1]

Russula chamaeleontina[2]

Russula emetica[n]

Russula, near *R. flava*[nn]. This beautiful yellow species occurred abundantly under beech trees.

Russula foetens[nnn]. Especially under beech trees, occurring in large groups.
Russula granulata[1]
Russula Mariae[nnn]
Russula ochroleuca[1]
Russula pectinata[1]
Russula stricta[1]
Russula subusta[1]
Russula uncialis[1]
Russula[nnn] red, under beech, becoming somewhat acrid.
Schizophyllus alneus[n]
Stropharia semiglobata[2]
Vaginata plumbea[nn]. The gray and yellow forms were equally common.
Vaginata plumbea strangulata[3]. No intermediates were found between this and the gray form of *V. plumbea.*
Venenarius Frostianus[nnn]. The slender and robust forms were both common under beech trees.
Venenarius muscarius[1]
Venenarius phalloides[n]. The white and umbrinous forms were equally common.
Venenarius rubens[n]. Under beeches and sugar maples. Often parasitized by *Hypomyces hyalinus.*
Venenarius solitarius[1]. A single specimen was found of the form described as *Amanita onusta.*

C. GASTEROMYCETES

Puffballs were not abundant, except *Scleroderma aurantium,* the hard-skinned puffball.

Bovista pila[1]
Crucibulum vulgare[1]
Geaster saccatus[1]. On a much decayed log.
Lycoperdon gemmatum[1]
Lycoperdon separans[2]. Grassy places in the open.
Lycoperdon subincarnatum[3]
Nidularia pisiformis[1]. On a fallen dead branch.
Scleroderma aurantium[nnn]. Abundant under all kinds of trees.

PRINCIPAL POISONOUS AND BITTER SPECIES COLLECTED

Melanoleuca albissima
Panaeolus campanulatus
Panellus stipticus
Russula emetica
Russula foetens
Suillellus luridus
Tylopilus felleus
Venenarius muscarius
Venenarius phalloides

NEW YORK BOTANICAL GARDEN.

DOTHICHIZA POPULEA IN THE UNITED STATES

George G. Hedgcock and N. Rex Hunt

(With Plates 194 and 195, Containing 6 Figures)

A New Fungus Outbreak in the United States

The black poplar (*Populus nigra* L.), especially the variety known as the Lombardy poplar, is one of our most beautiful ornamental trees. It is, however, subject to diseases which shorten its life. In the United States these diseases apparently have not been studied to any extent, as there is a lack of literature on the subject. During the spring of 1916, many reports were received by the United States Department of Agriculture concerning a serious blight of newly transplanted black poplars. In one instance, every tree in a lot of thirty was killed back by cankers. In a second instance, nearly all of 630 trees were badly infected with cankers, and at least one fourth of them were killed back to the point of the infection.

An examination of cankers from the trees mentioned above and from other localities showed that in a great majority of cases only one fungus was present in the cankers. This fungus has been isolated and studied. Morphologically it is identical with *Dothichiza populea* Sacc. & Briard.

A number of nurseries in the eastern United States have been examined with reference to the presence of this disease. In some instances, varieties of the black poplar were found very much diseased, thus accounting for the specially bad outbreak among recently transplanted nursery stock. It was also ascertained that in a number of localities adjacent to the infected nurseries nearly all the black poplars and some of the Canada poplars, or cottonwoods (*Populus deltoides* Marsh), had been attacked by the disease.

At the same time a hasty preliminary survey was made of several localities for the presence of the disease on poplars planted

for shade or ornament. In some of these localities, black poplars, mostly recently planted, were found to be seriously diseased. In three cases only, a few large trees were found, not only of the black but also of the Canada poplar, which had apparently been diseased for several years. A future study of the cankered areas on the trunks of these trees will probably establish approximately the date of their formation.

In 1915 two specimens of diseased black poplar were sent by Joseph L. Richards to the Plant-Disease Survey of the Department of Agriculture, one from West Lynn, Mass., and the other from Hanover, N. H. Both specimens have since proved to be attacked by *Dothichiza populea.* Mr. Richards reported a badly diseased condition of poplars in both localities in 1915.

EARLIER OUTBREAKS OF THE FUNGUS IN EUROPE

Dothichiza populea was first described and named in 1884 by Saccardo and Briard (4: 672),[1] who reported the fungus as occurring as a saprophyte on the dead branches of *Populus* at Troyes, France.

Krieger[2] later distributed specimens of *Dothichiza populea* collected on limbs of *Populus nigra* near Königsten, Saxony, March 28, 1893, one of which has been examined by the writers.

Delacroix (1), in 1903, was the first to make a careful study of *Dothichiza populea* and to note its real effect on poplars. He not only ascertained that the fungus was parasitic in its nature, but also that it was the cause of a serious disease in France. Among the varieties of poplars attacked, he mentions *Populus virginiana* (a synonym for *Populus deltoides*), *Populus nigra,* and *Populus bolleana.* The disease was found in a number of localities and had been observed for several years previous to the time of publication. In 1906 (2), he published an additional article on the disease, adding to the data on its distribution and to the knowledge of the fungus, at the same time giving directions for its control.

Voglino, in 1907 (6: 193, 196), reported *Dothichiza populea*

[1] The figures in parentheses refer to "Literature cited" at the end of this paper.

[2] Krieger, K. W. Fungi Saxonici Exsiccati. No. 1100. Konigstein.a.E., 1895.

as causing a disease of Canada poplars near Turin and in other localities in Italy. In 1910 (7: 285–287) and 1911 (8: 325–337) he published additional articles, which contain the results of a lengthy investigation of both the disease and its causal fungus. He reported proof both by cultural studies and by inoculations that *Dothichiza populea* Sacc. & Briard is the pycnidial form of the ascomycete *Cenangium populneum* (Pers.) Rehm. He found that the fungus is the cause of a very serious disease of poplars, especially the Canada poplar, in various parts of Italy.

From the foregoing data, it appears quite possible that *Dothichiza populea* has been imported, though not very recently. A great quantity of nursery stock has been brought to this country from Europe, and the fungus could easily have been brought in previous to the enforcement of the present inspection laws.

On the other hand, the fact that this disease has not been reported previously from this country by any of the state pathologists and that earlier specimens of *Dothichiza populea* have not been collected by the pathologists of the United States Department of Agriculture indicates that it is a somewhat recent disease in the United States.

This assumption is further strengthened by the absence of *Dothichiza populea* from the exsiccati that have been collected in this country and the fact that there is apparently no mention of it in our literature.

DESCRIPTION OF THE DISEASE CAUSED BY DOTHICHIZA POPULEA

Dothichiza populea attacks the trunk, limbs, and twigs of both the black and the Canada poplars. It primarily causes the formation of cankers, which at first appear as depressed, slightly darkened areas in the bark, usually on the trunk around the base of a small limb or twig (*pl. 194, f. 2, 3*). The cambium is killed and turns brown (*pl. 195, f. 3*). Pustules of the fungus soon appear on the canker, giving the surface a roughened appearance (*pl. 194, f. 2, 3*). In trees that have become well established in the soil a marked resistance of the host to the fungus frequently takes place. In such cases the growth of the fungus is checked, the canker limited to a small patch of varying shape and size, and the bark is frequently cracked at the edge of the canker by the

rapid growth of the cambium in the callus that is now formed (*pl. 194, f. 2*). As the canker becomes older, the bark sloughs off, leaving an open wound on the trunk, surrounded by apparently healthy bark. Meanwhile, the fungus attacks the limb or twig around the base of which the canker was formed, spreading very rapidly through it, forming pustules over a large portion of the bark.

Cankers much like those on the trunk are frequently formed on the lower limbs and twigs of diseased trees. On the larger limbs, their formation and appearance are much like those on the trunk. When the fungus attacks smaller limbs and twigs the canker usually extends around each limb or twig and very soon kills it (*pl. 194, f. 1*).

In trees recently transplanted and in trees heeled in for early planting in the spring, the fungus spreads most rapidly. Transplanted trees may become badly diseased by cankers formed from fresh infections between October and the following May (*pl. 195, f. 1, 2*).

Dothichiza populea is the most rapidly growing canker-producing fungus known to the writers. One canker selected from a number produced on black poplars between October, 1915, and May, 1916, was twelve inches long and encircled the trunk of the tree for nearly two thirds of the length of the canker. In the same lot of trees, out of 100 examined 90 were diseased either in limbs or trunk, 27 were girdled at the trunk by cankers which had killed the tops of the trees, and 13 more had distinct trunk cankers which had not yet encircled the trunks.

Dothichiza populea causes but slight outward discoloration of the bark in the cankers it produces, the color being slightly darker. The fruiting bodies (pycnidia) of the fungus are formed beneath the surface of the bark and cause marked elevations or pustules to appear on the cankers soon after they develop (*pl. 195, f. 1, 2*). These pustules are smooth on the surface at first and have the same color as the adjacent bark. At maturity they rupture near the center of the top and small cream-colored tendrils are exuded, which gradually assume a tawny olive to a walnut-brown color. These are composed of millions of pycnospores, which spread the disease to adjacent trees. According to

Delacroix, these spores are wind disseminated; but as they are in a somewhat sticky mass at first, insects or birds might carry them, as in the case of the chestnut-blight fungus (*Endothia parasitica* (Murrill) Anderson & Anderson) as reported by Heald and Studhalter (3), and Studhalter and Ruggles (5).

EFFECT OF THE DISEASE ON POPLARS

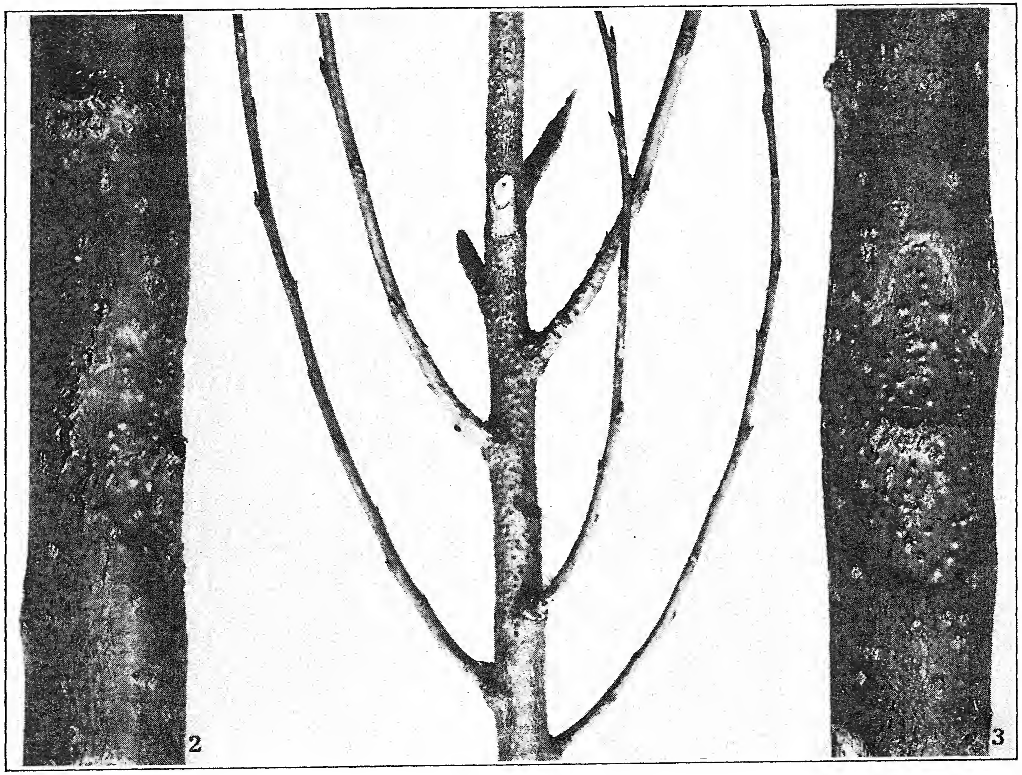
Dothichiza populea at first kills a few limbs here and there on younger trees in the nursery rows. The cankers on such trees, owing to the fact they are not conspicuous at first, are easily overlooked. When the disease becomes well established many of the lower limbs are killed and rapidly growing sprouts are sent up from the bases of the trees below the cankered areas. These sprouts, though vigorous, are soon infected by the fungus and are likely to be removed and used for cuttings, under the impression that they are healthy.

On older trees in nursery rows and on well-established shade trees the lower limbs are killed by the fungus and scars are soon formed by cankers on the trunks, which are thereby rendered unsightly. At the same time tufts or clusters of rapidly growing sprouts are sent out near or below diseased areas. These in turn are killed by the fungus, which gradually spreads to all parts of the tree, finally killing it.

In case of freshly transplanted trees, the disease is much more virulent. Cankers may encircle either the trunks or main limbs of the trees, killing them. In the case of black poplars, the beautiful tapering cone-shaped outline of the tree is destroyed. Trees once attacked apparently never recover their former beauty, even where the dead parts have been carefully removed.

In France, Delacroix (2) reports the disease as especially severe on nursery stock and younger trees and of less importance on old-established trees. There, as in the United States, it destroys the beauty of the black poplars. It also causes considerable loss to growers of Canada poplars who raise the trees for saw logs.

The disease in Europe is reported both by Delacroix (1, 2) and by Voglino (6, 7, and 8) as especially severe on Canada poplars, but in the United States, so far, it has been found in a serious form only on black poplars.



DOTHICHIZA POPULEA SACC. & BRIARD

DESCRIPTION OF THE FUNGUS

The following description of *Dothichiza populea* Sacc. & Briard is based on specimens from ten different collections from seven different states. The spore measurements are based on 100 spores, 10 from each collection.

Pycnidia, numerous in the bark, at first in pustules covered by the epidermis of the host, rupturing at the top when mature, the tops of the pustules later breaking away, leaving pseudo-acervuli, lens shaped to subspheroid before rupturing, often irregular in shape, ¾ to 1½ mm. in diameter; walls black, with irregular surface at the base on the inside; spore masses ejected in cylindric tendrils, usually short, creamy to tawny olive or walnut brown in color; spores subglobose to ovoid, or rarely ellipsoid, smooth, hyaline when viewed singly, smoky in mass; $9.5–17 \times 6.7–12.7\,\mu$, averaging $12.1 \times 8.6\,\mu$; germinating at the smaller or basal end.

Spores of *Dothichiza populea* from No. 1100, Krieger, Fungi Saxonici Exsiccati, on *Populus nigra,* measure as follows: $10.1–12.2 \times 7.3–10.2\,\mu$, averaging $11.6 \times 9.1\,\mu$. It must be noted that these spores were measured from dried material mounted in water, while those on which our description is based contain the measurements from five fresh specimens, three partially dried specimens, and two thoroughly dried specimens. The dried specimens yielded slightly smaller measurements.

DISTRIBUTION OF THE FUNGUS

Dothichiza populea has been collected in the United States on the following hosts:

Populus nigra

New Hampshire: Hanover, by J. L. Richards, June, 1915 (P.D.S.[3] 662).

Massachusetts: West Lynn, by J. L. Richards, June, 1915 (P.D.S. 611).

New Jersey: Morrisville, by George G. Hedgcock, June, 1916 (F.P.[4] 22353).

Pennsylvania: Delaware Water Gap, by N. M. Goodyear, May, 1916 (F.P. 22362). By George G. Hedgcock in 1916, West

[3] P.D.S., Plant-Disease Survey.

[4] F.P., Forest Pathology.

Chester (F.P. 22369, 22370, 22371, 22372, and 22373); Frazer (F.P. 22374); Wayne (F.P. 22378); Wynnewood (F.P. 22381); Rosemont (F.P. 22382); Haverford (F.P. 22393); Allen Lane (F.P. 22391); Chestnut Hill (F.P. 22385, 22387); also by S. B. Detwiler (F.P. 22395).

Delaware: Wilmington, by G. S. Mattingly, May, 1916 (F.P. 22281); by George G. Hedgcock, June, 1916 (F.P. 22357, 22358, and 22359).

Maryland: Baltimore, by J. A. Byrne, May, 1916 (F.P. 20877); by George G. Hedgcock, May, 1916 (F.P. 22303).

Ohio: Cincinnati, by George G. Hedgcock, June, 1916 (F.P. 22316).

New Mexico: Estancia, by F. C. Werkenthin May, 1916 (F.P. 22363 and 22364).

Populus deltoides

In Pennsylvania: By George G. Hedgcock, June, 1910, Berwyn (F.P. 22377); Wayne (F.P. 22379); Chestnut Hill (F.P. 22388); Haverford (F.P. 22393).

From the foregoing, it will be seen that the fungus has been widely distributed in the United States, since its present known range is from New Hampshire to New Mexico. However, a preliminary survey indicates that many localities are free from the disease.

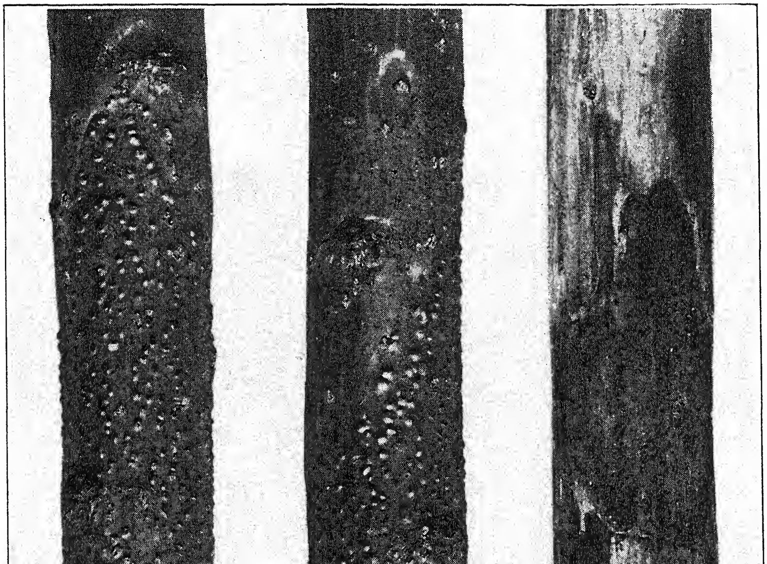
Dothichiza populea has been reported from Europe as follows:

In France, according to Delacroix (1), *Dothichiza populea* was well established as early as 1903. He reported it at that time in Monterau (Seine et Marne), Villeneuvre-la-Guyard (Yonne), Montauban, Agen, and Paris.

In Italy, according to Voglino (8), Cavaglia in 1901–1902 noted cankers, apparently caused by *Dothichiza populea*, on Canada poplars near Santena. In 1906 Zoppa noted the disease near Crema. In 1907 Voglino, in addition to the localities previously mentioned, received numerous reports of the disease from various regions in Italy, as well as from Sardinia and from Switzerland.

In Germany no outbreaks of the disease have been reported.

The writers so far have not found *Cenangium populneum* (Pers.) Rehm on poplars in the territory investigated, either



DOTHICHIZA POPULEA SACC. & BRIARD

alone or in association with *Dothichiza populea* Sacc. & Briard. The relationship of the two fungi in the United States will be made the subject of further investigation. It has, however, been collected on *Populus tremuloides* as follows: At Middlebury, Vt., by E. A. Burt, April, 1896,[5] and at Orono, Maine, by P. L. Ricker, May 14, 1898.[6]

SUGGESTIONS FOR THE CONTROL OF THE DISEASE

This disease apparently has its main centers of infection in our nurseries, and it is here that the first work of control should begin. All poplar trees that are blighted in the twigs or limbs or that show cankers should be dug out and burned. It will be better for the nurseryman to err on the side of caution than to allow this disease to gain a foothold in his nursery. A small infected twig on an otherwise healthy tree may infect all the trees in a bundle of transplants, and once infected the trees are ruined, as the fungus kills them back and spoils their beauty.

Poplars planted as ornamentals that become badly diseased should be dug up, removed, and burned. This treatment may seem to be severe, but in view of the fact that the disease appears to be a dangerous one it is the only safe course to pursue if it is to be exterminated. This disease has been under observation for a short time only, and no experiments for its control have been made.

Delacroix, among other suggestions, recommends the following treatment for the disease, but does not report its effect: The destruction of all diseased trees or diseased material; the disinfection of tools used in this work; the disinfection of the clothing and hands of workmen thus engaged; and the dipping of cuttings before planting in an acidulated Bordeaux mixture containing at least 10 per cent. of copper sulphate.

The writers would be glad to receive specimens of this and of other poplar diseases from as many localities as possible.

BUREAU OF PLANT INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE.

[5] Ellis, J. B., and Everhart, B. M. North American Fungi. No. 3536. 1898.

[6] Ricker, P. L. Flora of Maine. No. 388. 1898.

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5. **Studhalter, R. A., and Ruggles, A. G.,** 1915. Insects as carriers of the chestnut-blight fungus. Pa. Dept. Forestry Bul. 12, 33 pp., 4 pls. Literature cited, pp. 28–32.
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7. ———, 1910. I parassiti delle piante osservati nella provincia di Torino e regioni vicine nel 1909. *In* Ann. R. Accad. Agr. Torino, v. 52, 1909, pp. 277–306.
8. ———, 1911. I nemici del Pioppo canadense di Santena. Nemici vegetali. *In* Ann. R. Accad. Agr. Torino, v. 53, 1910, pp. 325–377, figs. 1–4.

EXPLANATION OF PLATES

PLATE CXCIV

FIG. 1. The top of a black poplar affected and killed by *Dothichiza populea.*

Fig. 2. Section of a trunk of a young black poplar recently transplanted, showing a young canker caused by *Dothichiza populea.* The fungus entered through a twig.

Fig. 3. Front view of the canker shown in *f. 2.*

PLATE CXCV

Fig. 1. Section of the trunk of a black poplar showing an older canker produced by *Dothichiza populea.*

Fig. 2. A canker still older than that shown in *f. 1.*

Fig. 3. A section of the trunk of a black poplar from which the bark has been peeled, showing two browned, dead areas caused by cankers of the fungus.

THE AECIAL STAGE OF COLEOSPORIUM RIBICOLA

W. H. Long

On a recent field trip to Bear Canyon, located in the Sandia Mountains about twelve miles from Albuquerque, New Mexico, the writer found a Peridermium on the needles of piñon (*Pinus edulis*). The infected piñons were growing in close proximity to *Ribes leptanthum,* which is rather common near the bottoms of canyons. Several days later, a trip was made to Tejano Canyon, about twenty-eight miles from Albuquerque, where the Peridermium was again found on piñon in close association with Ribes plants.

Inoculations under control conditions were made on two species of Ribes from both of the collections. Sowings of aeciospores from the Bear Canyon material (F.P. 21164) were made April 29 on *Ribes leptanthum* and *R. longifolium.* On May 16 the uredinia of a Coleosporium appeared on the lower surface of the leaves of *R. leptanthum* (the *R. longifolium* plants which were inoculated damped off). Sowings of the aeciospores from the Tejano Canyon material (F.P. 21165) were made May 3 on *R. leptanthum* and *R. longifolium.* Uredinia appeared May 18 on the lower side of the leaves of both of the species of Ribes inoculated. The control plants of each set of inoculations remained free from the rust.

The Coleosporium obtained by inoculating the Ribes plants with the aeciospores of the Peridermium from piñon proved to be identical in all its characters with *Coleosporium ribicola* (E. & E.) Arthur. This infection of the Ribes leaves by the piñon Peridermium, thereby producing the typical uredinia of *C. ribicola,* proves that this Peridermium is the aecial stage of *C. ribicola* and should be called *Peridermium ribicola.*

A technical description of the aecial stage of this fungus is given below.

PERIDERMIUM RIBICOLA

O. Pycnia amphigenous, scattered, sparse, low, conoidal, subcorticular, noticeable, dehiscent by a longitudinal slit, chestnut-brown, 0.5–1 mm. long by 0.3–0.5 mm. broad, about 100 μ tall.

I. Aecia from a limited mycelium, amphigenous, one to several on each leaf, not forming spots on leaves, erumpent from a narrow slit, flattened laterally, 0.5 to 1 mm. long by 0.5 to 0.8 mm. high; peridium colorless, fragile, cells slightly or not at all overlapping, outer walls smooth to slightly granular, inner moderately verruculose, lower peridial cells elliptical, lanceolate or oval, 33–50 by 16–24 μ, walls 2–3 μ thick, upper peridial cells approximately isodiametric, irregularly orbicular, 18–30 μ across, walls 2–4 μ thick; aeciospores elliptical-oblong, oval or obovate, 20–28 $\times$ 30–43 μ, average size for ten spores 23.7 $\times$ 36.2 μ; walls colorless, 2–3 μ thick, verrucose, with rather coarse irregular warts, which are tardily deciduous, without a smooth area on spore walls.

Both collections of *Peridermium ribicola* were made at an elevation of about 7,500 feet near the upper limit of the range of piñon in these two canyons (Bear and Tejano). Snow was still on the ground in the upper portion of the canyons and the ground was still frozen on some of the more protected slopes in the immediate vicinity of the infected piñons. The season was so early that a snow storm occurred while the writer was collecting the rust. Both collections had already discharged most of their spores. The above facts indicate that the peridia of this Peridermium were probably well developed before all of the snow had disappeared from under the piñons.

No indications of the aecial stage of this fungus were found below 6,500 feet elevation, although the piñon was still abundant.

The comparatively high altitude (for the aecial host) at which this Peridermium occurs and its very early appearance in the spring will probably explain why it has not been discovered before.

The coleosporial stage occurs at much lower elevations than the aecial since the writer found the rust on Ribes plants in Albuquerque (4,950 feet elevation). The coleosporial stage evidently reaches these lower altitudes through the successive infection of the Ribes plants throughout the summer months by the urediniospores, thereby materially extending the range of the rust beyond that of its aecial stage.

The coleosporial stage of this rust has been reported on the following species of *Ribes: R. grossularia* Linn., *R. inebrians* Lindl., *R. leptanthum* A. Gray, *R. longifolium* Nutt., *R. pumilum* Nutt., *R. purpusii* Koehne, and *R. valicola* Greene, and from three states, Colorado, New Mexico, and Wyoming. The writer has collected this Coleosporium on *R. mescalerium* Coville in Amole and La Junta Canyons, Santa Fe National Forest, New Mexico, October, 1914 (F.P. 21162 and 21161) and on *R. longifolium,* Albuquerque, New Mexico, October, 1914 (F.P. 21163).

Pinus edulis, the aecial host, occurs in Colorado, western Texas, eastern Utah, southwestern Wyoming, northern and central Arizona, New Mexico, and southward into Mexico. The known distribution of the coleosporial stage of this rust is, therefore, well within the range of its aecial host (*P. edulis*) and it is very probable that *Peridermium ribicola* will also be found to have practically the same general range.

OFFICE OF INVESTIGATIONS IN FOREST PATHOLOGY,
BUREAU OF PLANT INDUSTRY,
ALBUQUERQUE, NEW MEXICO.

NOTES AND BRIEF ARTICLES

Professor Thomas H. Macbride has been elected president emeritus of the State University of Iowa upon his retirement from the presidency at the age of sixty-eight.

Professor E. J. Durand, of the University of Missouri, spent part of the summer collecting in Wyoming.

Mr. Paul C. Graff has been appointed instructor in botany at the University of Montana, Missoula, Montana. He entered upon his new duties September 15.

Dr. W. A. Murrill has found that *Melanoleuca anomala* Murrill, published in MYCOLOGIA 5: 214. 1913, has pale-yellowish-brown spores instead of hyaline spores, and he therefore transfers the species to the genus *Inocybe,* the new combination being **Inocybe anomala** Murrill.

Dr. Donald Reddick, professor of plant pathology, Cornell University, and chairman of the editorial board of *Phytopathology,* has been granted sabbatic leave and will spend the ensuing academic year in special work in the laboratory of plant physiology, Johns Hopkins University.

Dr. Gertrude S. Burlingham, who contributed the descriptions of *Russula* for volume 9, part 4, of *North American Flora,* finds that *Russula subfragilis* Burl., on page 233, is preoccupied by *R. subfragilis* P. Henn. (in Warb. Monsunia 1: 149. 1899), and she suggests **Russula fragiliformis** Burl. as a new name for this species.

We learn from *Science* that Professor J. C. Arthur was assisted during July in the preparation of the remaining parts of the Uredinales for *North American Flora* by F. D. Kern, C. R.

Orton, F. D. Fromme, and C. A. Ludwig, all former members of Dr. Arthur's laboratory staff.

An article recently published by Mr. L. O. Overholts in the *Annals of the Missouri Botanical Garden* contains descriptions and illustrations of four new species of gill-fungi: *Claudopus subnidulans, Panaeolus reticulatus, P. rufus,* and *P. variabilis.* All of the species were collected by Mr. Overholts in the vicinity of St. Louis, Missouri.

Volume 6 of the *Memoirs* of the New York Botanical Garden contains thirty-seven papers presented at the celebration of the twentieth anniversary, among them "The development of *Lepiota cristata* and *L. seminuda*," by G. F. Atkinson, "Japanese species of *Gymnosporangium*," by F. D. Kern, "Chemotropic reactions in *Rhizopus nigricans*," by A. H. Graves, and "Bermuda fungi," by F. J. Seaver.

Dr. S. M. Stocker, of Duluth, Minnesota, contributes the following note: "On September 7, 1916, I found a specimen of *Pluteus cervinus* so much larger than any heretofore seen by me that I measured it. The outline of the cap was oval, not circular, and the measurements were 9½ × 7 inches. Perhaps this is not unknown, but it seems to me worth letting you know."

A fine fresh specimen of *Thelephora vialis* has been sent in for determination by Mr. Timothy E. Wilcox, of Washington, D. C. It is large, many times lobed, rosy-smoke-colored below and cream-colored to honey-yellow above, with a somewhat disagreeable odor in drying which is very noticeable. Dr. Burt reports a former collection of this species at Washington by Mr. F. J. Braendle.

The July number of the *Journal of Agricultural Research* contains an article on the disease of potatoes known as "leak," by Lon A. Hawkins. The disease usually appears after the crop has been harvested and according to Hawkins is caused by the fungus *Pythium debaryanum* Hesse. *Rhizopus nigricans* Ehrenb.

also causes a rot of potatoes similar to but not identical with this disease.

In the April number of *Phytopathology,* J. E. Howitt and W. A. McCubbin published an account of an outbreak of white-pine blister rust, *Cronartium ribicola,* in Ontario. The *Peridermium* stage has been found on both native and imported white pine and the *Cronartium* stage on five cultivated and four wild species of *Ribes.* Black currants have in several instances suffered severe injury from the disease.

Number four of the second volume of *Illinois Biological Monographs* consists of an account of the Porto Rican species of the genus *Meliola* by Professor F. L. Stevens. The number of species listed is 95, of which 56 are described as new. Six varieties are also recognized, all new. The paper contains five plates, consisting of photomicrographs, the most conspicuous feature of which is the absence of all detail. It is to be lamented that in a paper of this size and importance more time and attention has not been devoted to the matter of illustration.

Among specimens of fungi recently collected in Surinam by Mr. Jacob Samuels are the following: *Amauroderma Chaperi, Auricularia Auricula, Auricularia nigrescens, Cladoderris dendritica, Coriolopsis caperata, Cycloporellus iodinus, Earliella corrugata, Elfvingia tornata, Elfvingiella fasciata, Fomes Auberianus, Fomitella supina, Fulvifomes extensus, Guepinia spathularia, Lentinus strigosus, Pogonomyces hydnoides, Rigidoporus surinamensis, Stereum elegans, Trametes cubensis.*

The University of Illinois Agricultural Experiment Station Bulletin No. 189 contains the results of an extensive study of the parasitic species of *Rhizoctonia* in America. There are at present recognized two parasitic species of this genus, *R. Solani* Kühn and *R. Crocorum* (Pers.) DC. About 165 plants have been listed in the United States as subject to the attacks of *Rhizoctonia Solani,* including many floricultural plants, vegetables, and field crops. The disease produces damping-off of seedlings or rotting

of stems and roots, etc., the nature of the infection being essentially the same in different plants.

Two excellent illustrated papers on the Polyporaceae have been published during the past year by Mr. L. O. Overholts. The first is a treatment of the Polyporaceae of the middle-western United States, which appeared in *Washington University Studies* for July, 1915. The second, entitled comparative studies of the Polyporaceae, was printed in the *Annals of the Missouri Botanical Garden* for November, 1915. Students of this family of fungi should not fail to add these papers to their library.

Professor T. Petch has been studying the sclerotia of *Lentinus* found on stumps of *Hevea,* and he says that in addition to species possessing a true sclerotium, there appear to be others whose mycelium merely binds together the earth in a large compact mass, while *Lentinus similis* and *L. infundibuliformis* exhibit a third type in which the skeleton of the pseudosclerotium consists of the wood of the host plant. It is considered as still an open question whether these types are definitely associated with different species of *Lentinus* or are merely stages which may be assumed by the sclerotium in any given species.

In an article published in the July number of the *American Journal of Botany,* W. B. McDougall makes the following statement regarding mycorrhizal relations existing between mushrooms and the roots of forest trees:

"Three of the species of trees used in the present investigation produce ectotrophic mycorrhizas, the oak (*Quercus*), hickory (*Carya*) and linden (*Tilia*). The mycorrhizas of the oak are due to *Russula foetentula* Pk., those of the linden to *Scleroderma vulgare* Fr., and those of the hickory probably to *Laccaria ochropurpurea* (Berk.) Pk., though this last has not been definitely proven. In all of these cases no mycorrhizas were formed in the spring, but after the first of July mycorrhizas were formed whenever the roots were growing well."

Dr. E. A. Burt's valuable articles on the Thelephoraceae of North America are appearing regularly in the *Annals of the Mis-*

souri Botanical Garden. His fourth article contains a treatment of *Exobasidium* and the fifth a treatment of *Tremellodendron, Eichleriella,* and *Sebacina.* The following new species are published in these genera: *Tremellodendron tenue* Burt, collected in Jamaica by Murrill; *T. simplex* Burt, collected in Porto Rico by Johnston; *Eichleriella Schrenkii* Burt, collected in Texas by Schrenk; *E. gelatinosa* Murrill, collected in Jamaica by Murrill and Harris; *Sebacina chlorascens* Burt, collected in Florida by Thaxter; *S. Shearii* Burt, collected in Washington, D. C., by Shear; *S. monticola* Burt, collected in Colorado by Hedgcock; *S. cinnamomea* Burt, collected in Maryland by Shear; *S. adusta* Burt, collected in Idaho by Weir; *S. plumbea* Burt, collected in Washington by Suksdorf; and *S. atrata* Burt, collected in Massachusetts by Farlow. There are also many new combinations.

Preparation of manuscript for the fungous parts of *North American Flora* is proceeding very satisfactorily. Dr. Arthur will soon complete another part on plant rusts. Dr. Seaver will send a part to press within a few months. Mrs. Flora W. Patterson, who is monographing the Exoascales, has received prompt and generous responses to her requests for material and will soon be able to complete her researches in this group. Mr. L. O. Overholts has undertaken the genus *Pholiota,* which he hopes to complete within a year. Dr. C. H. Kauffman has practically completed *Cortinarius* and will now take up *Inocybe.* He would be glad to receive material for the study of this difficult genus. Professor W. C. Coker has undertaken the Clavariaceae and has already spent some time at the Garden and also at Albany studying herbarium material. Professor E. A. Burt will be prepared to publish his researches on the Thelephoraceae in *North American Flora* as soon as the series of papers which he is publishing in the *Annals of the Missouri Botanical Garden* have been completed, which may require two or three years. A part on lichens has been arranged for by the cooperation of Professor Bruce Fink, Professor Lincoln W. Riddle, Professor A. H. Chivers, and Mr. W. C. Barbour.

North American Flora, Volume 9

This volume closes with parts 6 and 7, containing a treatment of *Clitocybe* and *Hygrophorus* by W. A. Murrill and a bibliography by J. H. Barnhart. In order to facilitate the use of the volume, the following indexes have been prepared: Index to Families and Tribes, Index to Recognized Genera and Species, Index to Species, and General Index.

As explained in the "Corrections" in part 6, the use of *Leptomyces* in part 5 was an error. The correct name of this genus is: *Hiatula* (Fries) Berk. Ann. Mag. Nat. Hist. II. **9**: 193. 1852. The type species is *Agaricus discretus* Fries, and the 5 species described on pages 309 and 310 should be corrected as follows:

1. *Hiatula discreta* (Fries) Sacc. Syll. Fung. **5**: 307. 1887.
2. *Hiatula minima* Berk. Ann. Mag. Nat. Hist. II. **9**: 193. 1852.
3. *Hiatula ciliatula* (Fries) Sacc. Syll. Fung. **5**: 306. 1887.
4. *Hiatula purpurascens* Berk. & Curt. Jour. Linn. Soc. **10**: 293. 1868.
5. *Hiatula Benzonii* (Fries) Sacc. Syll. Fung. **5**: 305. 1887.

An Experiment with Panaeolus papilionaceus

The following note was recently received from Mr. J. E. Fries, of Ampere, New Jersey:

"Last Sunday morning I had great difficulty in finding any mushrooms whatever, so I was happy when I finally came across a few specimens of Coprinus mixed in with a few of *Panaeolus papilionaceus*. I have never tried this last mushroom, but, as Mr. McIlvaine says that in small quantities they are harmless and contain a very mild intoxicant only, I did not hesitate to let them join the Coprini in the pot. The results, however, were very startling. Mrs. Fries could not possibly have eaten more than two or three of the caps and yet she exhibited all the signs of violent opium poisoning only five or six minutes after having eaten this mushroom. For a while she had difficulty in breathing and all the sensations in the brain described under acute opium poisoning. Drowsiness crept over her, but we took a walk and in about three to four hours it was all over save for a great feeling of weakness.

"I ate about five times as much as Mrs. Fries and in the beginning felt nothing. It took between one and two hours before the poisoning took effect on me. My respiratory organs were not affected at all, but for several hours, in fact, lasting from about 3 o'clock in the afternoon until 8 o'clock at night, I had all the queer mental as well as 'moral' sensations described in the 'Confessions of an Opium Eater.'

"If such small quantities of this mushroom can act so powerfully, it seems to me dangerous in the extreme to speak of its qualities in such light manner as Mr. McIlvaine does and I think the public should be strongly warned against using this species at all."

Lamprospora detonia sp. nov.

Plants scattered, 5 to 12 mm. in diameter, sessile, plate-like, with margins elevated about 0.7 mm., slightly incurved and free from substratum, regular in form, becoming convolute on drying; hymenium smooth, concave to plane, dark-brown to black with a green tint, the margin distinct and raised about 0.1 mm. from the apothecium, externally brown, rough and verrucose; asci cylindric, about 15 μ in diameter, up to 300 μ long, hyaline; spores 8, 1-seriate, crowded into the upper third or one fourth of the ascus, at first smooth, with a large oil-globule, dilutely colored, becoming minutely warted, brown and opaque so as to appear black under the microscope, 12 to 15 μ in diameter; paraphyses slender, yellowish, the apex thickened and colored.

Among moss on shaded ground, in woods on the banks of the Cheyenne River, near Anselm, N. Dak. This species differs from *L. trachycarpa* by the greenish tint of the hymenium and the smaller, minute, wart-like markings of the spores. When the plants are first raised from the shaded ground into sunlight, in a moment, a discharge of spores takes place. A small dust-cloud almost an inch high shoots up from the hymenium. The phenomenon may be explained by the warming and expansion of the air or gases in the lower two thirds of the asci. The spores, crowded into the upper end, are pressed against the operculum until it gives way and are then shot into the air.

J. F. BRENCKLE.

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INDEX TO VOLUME VIII

New names and the final members of new combinations are in **bold face type**

[1] This article contains an index to the Uredinales of the West Indies and also an index to their hosts.

[2] This article contains an index to new genera and species.